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A GUIDE TO STUDIES OF THE
BLM'S ROLE IN THE
WESTERN OREGON ECONOMY

June 1969

A Report to the
Bureau of Land Management
United States Department of the Interior

by
David H. Nelson

Master of Science Thesis
State University College of Forestry
at Syracuse University

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PREFACE

This report was made while I was employed by the Bureau of Land Management on a graduate trainee assignment to the Department of Forestry Economics at the New York State University College of Forestry at Syracuse University.

I am indebted to a number of persons for advice and assistance during the preparation of this report. Special acknowledgements are due to Dr. Neils B. Christiansen, my major professor, and Dr. William A. Duerr, both of the Forestry Economics Department, for their careful review of the drafts and suggestions for the final manuscript. Dr. Gerald J. Karaska, L. Peter Boice, and Peggy A. Lentz, of the Department of Geography at Syracuse University, gave valuable assistance in guiding my use of a component analysis program. Dr. Hays B. Gamble, of Pennsylvania State University, was helpful in formulating cost estimates for the studies proposed, drawing upon his own broad experience with similar input-output analyses. Interviews with other input-output researchers whose advice helped to guide model formation included: Dr. Robert Loring Allen, Dr. Philip Bourque, Donald W. Bromley, Dr. Herbert Stoevener, and Dr. Donald A. Watson.

I would also like to express my thanks to my family

whose understanding and help with the project has been considerable.

The assistance received from and the interest of the Bureau of Land Management in this endeavor is most especially appreciated.

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CHAPTER I

INTRODUCTION

This report comprises a set of alternative research plans and some information for weighing them. The plans are for studying the western Oregon economy, with emphasis on the role of the forestry operations of the Bureau of Land Management (BLM), U.S. Department of the Interior.

The present chapter introduces the report by explaining its purpose, its justification, and the procedure which was followed in producing it.

A. Purpose

The report has three immediate purposes. The first is to consider briefly some different methods for studying a regional economy and to identify one method (inter-industry analysis with the use of the input-output model) which is most promising for BLM use in western Oregon. The second is to describe the input-output model in detail and to appraise its merits and limitations. The third immediate purpose is to design four alternative input-output studies for BLM use, outline the procedures for their implementation, and estimate their costs.

Beyond its immediate purposes, the report is intended to pave the way for the BLM to develop a model of the western Oregon economy. The Bureau would use the model primarily as a predictive device, a means for judging the outcome of alternative land-management decisions, which would thus serve as a guide to land managers. The Bureau would use the model secondarily as a descriptive device, a means for deriving information on the role now occupied by the BLM in the economic life of the region.

B. Justification

The Bureau of Land Management needs to understand the effect of its work upon the regional economy and to make decisions which will benefit the region broadly in the long run because of the nature of its mandates. The O & C Sustained Yield Act of 1937 directs the Bureau to contribute "to the economic stability of local communities and industries."⁽¹⁾ Resource-use developments of more recent years have made clear the obligation of public resource managers to see their work in broad context and to take every means to comprehend the increasingly complex interactions between their programs and people's lives.

Regional economic studies have proved useful in judging the place of particular resources in the economy. They have proved useful in guiding decisions about resource development. For example, Dr. Hays B. Gamble of Pennsylvania State University, in The Economic Structure of Sullivan County, Pennsylvania,⁽²⁾ has used the input-output method to explore the potentialities of the forest resource in the development of a depressed area. The approach is just as promising for prosperous areas.

The report takes western Oregon as its study region because it is concerned with the forestry operations of the BLM, and these are heavily concentrated in this region. By western Oregon is meant the north-south strip of 18 counties running from the Washington state line to the California state line and between the Pacific Ocean and the Cascades ridge. Figure 1 outlines the region and shows where BLM lands are located. These 18 counties form a segment of the great region, extending from British Columbia into northern California, where Douglas-fir is the predominant forest type.

C. Procedure

The writer has followed five steps in the course of producing this report:

First, he reviewed the literature of regional analysis, with emphasis on the input-output method.

Second, he visited western Oregon in the summer of 1968, thereby supplementing some seven years of experience with the BLM in the region. He renewed his view of forestry and wood-industry operations, learned about data sources, and talked with knowledgeable persons.

Third, he studied the data on the forest resource and the economy of the region (Appendix C). Some of this data is used to guide the grouping of counties and economic activities. Two groupings of the 18 western Oregon counties were developed. One approximates the BLM's five administrative districts; the other is a sequence of combinations, grouping areas for their uniformity based upon many characteristics (Appendix D). He compared results of the groupings and noted their implications for the input-output study. The treatment also included two groupings of economic activities.

Fourth, he consulted with some of the national authorities on the input-output method and studied their writings: Dr. Hays B. Gamble at Pennsylvania State University and Dr. Herbert H. Stoevener at Oregon State University, ⁽³⁾ Dr. Robert L. Allen and Donald A. Watson

at the University of Oregon,⁽⁴⁾ and Dr. Gerald J. Karaska at Syracuse University.

Fifth, he put together in writing the salient features of what he had learned.

W. A. Goble and David L. Ragsdale, A Regional Analysis of Clinton County, Pennsylvania. Pennsylvania State University, 1961. Pennsylvania State University, College of Agriculture, Agricultural Experiment Station, 1961.

(4) Herbert E. Stevenson, "Acoustic Evaluation of Water Pollution Control Alternatives," Paper presented to the Committee on the Management of Water Resources Development of the Western Agricultural Research Research Council, Salt Lake City, December 18, 1963.

Herbert E. Stevenson, "Water Use Relationships as Affected by Water Quality on the Rio Grande," Paper presented at the Western Resources Conference, University of Colorado, Boulder, July 15, 1963.

Herbert E. Stevenson and J. M. Goble, "Estimation of the Magnitude and Distribution of Benefits From Operational Resource Management in the Security of a Small Area," Paper prepared for presentation at the annual meeting of the Association on the Development of Range Use and Development of the Western Agricultural Research Research Council, 1963.

Notes for Chapter I

(1) U.S. Statutes at Large, L, Part 1, 874 (1937),
"O & C Sustained Yield Act."

(2) Hays B. Gamble, The Economic Structure of Sullivan County, Pennsylvania (Bulletin 743; University Park, Pa.: Pennsylvania State University, College of Agriculture, Agricultural Experiment Station, 1967).

(3) Ibid.

Hays B. Gamble and David L. Raphael, A Micro-regional Analysis of Clinton County, Pennsylvania (2 vols.; University Park, Pa.: Pennsylvania Regional Analysis Group, Pennsylvania State University, 1966).

(4) Herbert H. Stoevener, "Economic Evaluation of Water Pollution Control Alternatives," Paper presented to the Committee on the Economics of Water Resources Development of the Western Agricultural Economics Research Council, Salt Lake City, December 18, 1963.

Herbert H. Stoevener, "Water Use Relationships as Affected by Water Quality on the Yaquina Bay," Paper presented at the Western Resources Conference, University of Colorado, Boulder, July 15, 1964.

Herbert H. Stoevener and A. A. Sokoloski, "Estimation of the Magnitude and Distribution of Benefits from Recreational Resource Management in the Economy of a Small Area," Paper proposed for presentation at the annual meeting of the Committee on the Economics of Range Use and Development of the Western Agricultural Economics Research Council, 1968.

CHAPTER II

SELECTION OF THE INPUT-OUTPUT MODEL FOR REGIONAL ANALYSIS

Methods abound for regional economic analysis, and so it is appropriate to explain why the input-output method has been selected. The requirements for the model adopted are as follows: First, it should cover the entire economic system of a region, indicating the effects of the sectors on one another: wood industries, recreation, local government and so on. Second, the model should be able to work with sub-regional economies so as to reflect geographic variation in economic activity and the impact of one sub-region upon another. Third, the model should be subject to empirical implementation. Fourth, it should be capable of serving as a decision-making tool, i.e., it should be able to forecast the likely consequences of alternative courses of action.

A. The Economic System

Regional inter-industry models treat the economy as a system with an inter-dependent structure. Economic activity occurs and develops in a spatial configuration which has natural resources, physiographic characteristics, and a state of technology at a given time. Points

in this space are separated by distance: the cost and time required for transportation. Economic activity occurs between firms (individuals, businesses, and governments) in the area and across its boundaries. Exchange patterns develop between firms, each of which is, at the same time, a producer and a consumer of goods and services. Over a period of time, firms tend to gravitate toward points where there is economic advantage. Clusters of activity are formed which represent market aggregation and stimulate specialization by producers. The economy which an area has achieved, including the technology of production and consumption, form a system and sub-systems and can be identified at a time, t .

An important criterion for delineating sub-regions is the degree of common economic interest within the system. Examples of such interest include employment in and economic dependence on some basic industry, degree of self sufficiency, or a geographic location which has a common economic advantage. Harmston and Lund define a community economic system as "a collection of activity, people, and producing units occupying a specific and recognizable geographic area, the members of which have common economic interests."⁽¹⁾ The idea of common

economic interest does not necessarily ignore social and political considerations. These may be inferred in the make-up of the economic variables. The pattern of government revenue and expenditure may be considered as a financial expression of political and other social factors. Changes in retail sales may express the gravitation of population toward areas of economic advantage or away from areas of diminishing economic advantage.

The common-economic-interest approach will be used in Chapter IV, where an attempt will be made to use several variables in identifying homogeneous economic sub-regions for western Oregon.

B. Regional Economic Study Alternatives

The field of economics has had, in its history, numerous surges of special interest which, to some extent, came in response to the needs of policy makers. The study of regional economics is, in a sense, one of these special interests. It represents the application of an intellectually developed theoretical construct.⁽²⁾ Regional economics focusses on sub-national economic systems. As in national aggregative models, it seeks to develop constructs which "explain" economic phenomena. It seeks to relate the variables in the region which are

(1) relevant to the problem being considered, (2) prominent in the economic system of the region, and (3) subject to being forecast. Regional economics, one of the many disciplines of regional analysis, is concerned with techniques for planning and development on a regional basis. Some models for regional economic analysis are these:

1. Economic base studies give a gross measure of a dichotomous inter-industry relationship, basic and nonbasic, and the trade relationship of the region being studied with the rest of the world. This method is too gross for decision-making by a single sector and suffers from the difficulty of defining which industries are basic and which, nonbasic; and which industries are exporters and which are non-exporters.

2. Linear programming might be used in regional and inter-regional economic analysis. Linear programming is a mathematical technique for optimizing a specified function. The use of this method in inter-industry regional economic studies is limited by data requirements, which exceed those for the input-output method. (3) A second restriction upon linear programming for regional interindustry use is the problem of development and acceptance of a rational objective function which could be a goal for society in the region.

Linear programming has been used on single industry problems in a region or between regions. Henderson⁽⁴⁾ developed a linear programming model for optimum allocation (to minimize total cost) in producing coal. However, cost minimization may not be a desirable social goal, particularly if it involves drastic dislocation of communities.

3. Regional income and product accounts similar to the national income and product accounts would provide data for the macroeconomic models of Keynesian and classical economics. Regional accounts would permit construction of the macroeconomic models on a regional scale and would give indications of changes in regional investment, consumption, income and savings. These are gross measures of performance. They do not recognize industry-by-industry detail, not do they measure impacts on the economic system of changes in a single sector. The variety of data needed, the need for regular re-measurement if time series are to be used, and the generality of this model eliminate it for present purposes.

4. The input-output model takes account of the economic system in an area, its specialization in production, and the consequent trading patterns. The trading

patterns will be between groups of similar firms (sectors) within sub-regions, between sub-regions, and between the region and the rest of the world. Specialization and trading lead to interdependence of the firms and areas for buying inputs and for selling outputs. The model assumes inputs (purchases) are equal to outputs (sales) for each firm and for the system. It assumes that the proportions of inputs into a sector and the ratio of inputs to outputs remain constant over time even though the level of output varies; thus the system can be reduced to a linear mathematical model. The assumption of linearity is reasonable in the short run because of the stability of economic, social, and legal institutions. Over longer periods, these are subject to change, and where such modifications may be anticipated, the input-output coefficients may be modified to incorporate the new values and to use them to improve estimation of the economic effect. Many influences act to alter the constant inputs, including (1) price changes (the model assumes prices to be constant and therefore abstracts from reality the price influences upon substitution), (2) technology, and (3) economies-of-scale in production and marketing.

Acceptance of stability of inputs within the system implies the assumption that the proportion of total

input derived from outside the system will remain stable and that inter-regional trade will be proportional to output.

Four methods of regional economic analysis have now been briefly reviewed. Most are found to be unsuitable for the purposes of this study either because of inadequate detail (base studies and regional accounts) or lack of development for implementation (linear programming). Two methods of regional economic analysis have been used extensively because they can be implemented empirically: base studies and the input-output method. Only the latter provides a suitably detailed approach. The input-output model will be described in the next chapter.

C. Relation of the Input-Output Method to Microeconomics and Macroeconomics

It is useful to contrast the purposes, assumptions, and limitations of the input-output method and the better-known methods of partial and aggregative economics. The purpose of microeconomics, a partial equilibrium analysis, is to explain the responses of producers and purchasers of a given commodity in determining the equilibrium level of price and output. The use of intersecting supply and demand schedules assumes no significant change in the use of the commodity by other sectors.

The input-output method, however, assumes that supply and demand are in equilibrium, and, with the assumption of constant prices, it concentrates upon investigating the effects of sector interactions and the horizontal shifts of the equilibrium output level. The input-output model is used to calculate a consistent level for the new output of each sector of the economy in response to a specified change in the production level of one or more sectors. Chenery and Clark summarize this assumption in the following terms: ⁽⁵⁾

"It is assumed that producers have little or no choice as to factor proportions in the short run and react to demand changes by changing output rather than price."

Macroeconomics (aggregative income analysis) and input-output analysis rely more upon uniformities of aggregate behavior than upon deduction of rational action by representative microeconomic units. Income and product accounts and input-output analyses may determine total income and production respectively, from assumptions of the method and by study of self-determining (exogenous) sectors. Exogenous sectors, such as investment, consumption, and government, appear in variations of Keynesian and classical models. A similar aggregation gives a corresponding version of the input-output model, where the exogenous sectors may be the same but where the producing sectors are explicitly recognized.

The input-output model is capable of distinguishing the different effects on the various sectors as a result of a change in the use of a sector's output, a distinction which is concealed in the Keynesian macroeconomic model.

D. Inter-Industry Economics and History of the Input-Output Method

Inter-industry economics is concerned with the quantitative analysis of the inter-dependence of producing and consuming sectors which together make up the economic system of a region. It deals with the relations of other producing sectors, as competitive users of scarce resources, and as suppliers of final consumer demand.

Concern for the structure of economic activities was expressed by Francois Quesnay in 1758 in his Tableau Economique, in which he depicted "successive rounds of wealth-producing activity which result from a given increment in output"⁽⁶⁾ and which stressed the inter-dependence of economic activities.⁽⁷⁾ The development was extended by Leon Walras in his Élément d' économie politique pure, published in 1874. He was interested in price determination and in particular the "simultaneous determination of all prices in the economy."⁽⁸⁾ The transition from partial to general equilibrium and his interest in production equilibrium led to his theory of

production which used "coefficients of production." These he considered to be determined by technology; they expressed the relative quantities of factors (inputs) required for the production of "a unit of each kind of finished goods."⁽⁹⁾

The theoretical model of Walras was simplified by Wassily Leontief of Harvard who was the first to formulate an interindustry model which could be empirically implemented. Leontief's system, developed in the 1930's and first published in 1936,⁽¹⁰⁾ is known as input-output analysis. The simplifications necessary for empirical implementation include omission of the effects of limited factor services (capital, natural resources, labor) available in the system and the use of fixed coefficients of production instead of a built-in mechanism for substitution among inputs. Fixed coefficients have the effect of disregarding the influence of price changes on (1) the composition of consumer demand, (2) purchases of goods by producers for use in a production process (intermediate use), and (3) the amount of labor supplied. The elimination of many of the adjustment mechanisms requires that the input-output analyst be sensitive to these constraints in reality, and exercise care in his use of the model and his interpretation of the results. Some of the required adjust-

ments may be imposed upon the model by the investigator through modifications in the transactions, direct effect, or sector inter-dependency arrays. Specified output levels which require resources in excess of the amount available must be rejected or plans to expand the resources must be provided. When the model is used for forecasting and a technological change is anticipated in the forecast period, the coefficients of the model (described in Chapter III) may be modified. Such modification would be appropriate for testing effects of automation or hypothesizing a new sector. The technological change in railroads caused by conversion of steam to diesel locomotives is an example of a foreseeable change in input coefficients.

Development of the input-output model as a tool of analysis has continued since 1936, with the construction of many national and sub-national models. Several useful applications of the model have not eliminated its controversial aspects or its theoretical deficiencies, but they have demonstrated the model's usefulness and the approaches which can be followed to avoid some of its limitations.

Some criticisms of the input-output model assume that alternatives, such as national income and product accounts data, are available. Not only do these differ

in purpose, but the accounts data are generally not available on a regional basis. Where an analysis is to be developed for a whole regional economy and the purpose includes measuring the effects of changes in specific sectors, the input-output model is most appropriate. Carl F. Christ, in a review of the method which contains some reservations about the then-available (1955) empirical results, concludes that:⁽¹¹⁾

"I believe that input-output is the best technique now available for handling problems that require a picture of the production function of the entire economy and that its results can serve as first approximations from which to start making corrections where special information permits or experience demands."

The use of the model since Christ's observations, particularly its regional applications such as those described in Section F, have provided evidence of the usefulness of the model.

Small area input-output studies have been made extensively in the United States, and bibliographies of the literature have been compiled.⁽¹²⁾

E. Use of the Input-Output Model

The input-output model may be used as either a descriptive or an analytical device. When the model is used for description, aggregation of all economic units into sectors and the presentation of transactions as a matrix give a concise, consistent, and complete record of the economic system. The perspective in which the

economy is placed helps in evaluating the sectors and their inter-dependencies.

A further descriptive step may be taken by rearranging the sectors to show structural inter-dependence in rank order. The rearrangement tends to give a triangular matrix which indicates the self-sufficiency of the economy and provides a better basis for development planning. A representation of the degree of economic development is given by the ordering of the sectors and blocks of inter-industry transactions. Underdeveloped or underdeveloped industries appear as zero, or low values, in the matrix. Analysis of the structural description may lead to the identification of development opportunities to the study of the feasibility of their development, which would provide greater self-sufficiency and growth in the region.

The input-output model used as an analytical tool describes the properties of an economic system so that the model can be worked to produce conditional forecasts. The first type of forecast is that made to determine a new equilibrium level resulting from a change, but for an unspecified time. This is called impact analysis. A second type of analytical use is the intermediate or time series forecast which may be made to show the incremental effects of change occurring in predictable stages.

Impact analysis makes an estimate for a specified change, a "what if" estimate which indicates the consequences of a change in the equilibrium output level with a static model, which does not include estimates of the expenditures for, or depletion of, capital in the transition stage. Estimates about the economic consequences of an impact on the system can be useful in planning or selecting corrective actions.

The usefulness of the model as an analytical tool for forecasting is related to three points. The first is the degree of importance of interindustry and inter-subregional transactions in the regional structure. Secondly, the accuracy of the future estimates depends upon the validity of the assumptions in the model for the system and the problem being investigated. This is related to technological changes and changes in prices, which could lead to changes in trade, either between industries or between regions. If they are anticipated, the model should be modified as suggested earlier, to incorporate them. Third, a variable in the projection of economic activity for the system is the accuracy of the estimate of final demand (capital formation, government expenditures, exports, etc.). Of the uses presented -- description and forecasting -- time series forecasts are most subject to error, which will increase

as the forecast year becomes more remote, and consequently uncertainty will increase.

The input-output model being developed in this report is static; it does not adjust automatically to changes in system variables, nor does it include time as an explicit variable. It will utilize location classification of transactions and be partially closed; that is, it includes in the production sectors, a sector(s) which might also be considered final demand (households), and so it incorporates calculation of the new household consumption level as it responds to hypothesized changes. It will also be an inter-regional in addition to being an inter-industry model. The description, impacts and projections derived from such a model are internally consistent and inclusive. Other projection methods, such as a partial forecast of a single product or sector, can be made by extending a time-series or by regression analysis. For an entire economic system, these changes would have to be related to each sector. A change in one sector should be related to all other sectors affected. This seems to be the merit of the input-output model: internal consistency of the solution for each sector through inter-dependency of the sectors.

The model is flexible in its configuration of

sectors. It permits exploration of the interdependencies between the economic sectors of particular interest and the impact on the system, of changes in one of the sectors. This is of importance to the problems envisioned for study by the model in western Oregon. An improved understanding of the economic system and its complexity is seen as a significant benefit to the planner and decision-maker.

F. Applications of the Input-Output Model

A few selected regional input-output studies will be considered briefly to illustrate the scope of such studies:

A study of Sullivan County, Pennsylvania, by Dr. Hays B. Gamble, was made to assess the practicality of local direct sampling to obtain data for the model. He also used the model to consider the impacts of various alternative ways to improve the economic conditions in this rural Appalachian county. He concludes by suggesting that the method "may be of significant help to those responsible for shaping the future course of economic development in a region."⁽¹³⁾

A later study by Dr. Gamble, that of Clinton County, Pennsylvania, applies the primary data collection approach to completing the model, to a more industrial county in both regional and inter-regional forms of the model.⁽¹⁴⁾

In volume II of this study, he derives the input model in an interesting way when he shows it as a simplification of a linear programming model.⁽¹⁵⁾ He describes impact analysis and forecasting with the model and utilizes the technique of coefficient modification noted on page 12. The impact analysis included (1) the effects of "closing down" part of an industry, phasing it out over a period of time, (2) automation of a paper mill, and (3) introduction of new economic activities (a recreation facility, a meter factory, a particle board mill, and the construction of an interstate highway).

Carden and Whittington, in Studies in the Economic Structure of the State of Mississippi, use the input-output model to identify potential development opportunities. Using a "skyline" chart to depict the output and trade balances of the sectors, they identify low production sectors in a natural grouping of sectors in which regional production might appropriately be increased.⁽¹⁶⁾

Allen and Watson, in The Structure of the Oregon Economy: An Input/Output Study, attempt to estimate the values of the transactions, direct effect and interdependency matrices for Oregon.⁽¹⁷⁾ They qualify their work as preliminary because it uses adaptations of co-

efficients from the national input-output model. The use of national coefficients for regional models has been criticized and its use is justified only as an expedient until the Oregon economy is actually measured. The Oregon model is general in scope and does not concentrate to a noticeable degree on the forest-resource-using sectors.

Gray and Carruthers have also developed an input-output study, Economic Impact of Recreational Developments in the Reserve Ranger District.⁽¹⁸⁾ This study considers the economic effects of increased recreational activity resulting from the construction of a recreational reservoir which is planned for the area. Forecasts are made for the years 1967, 1977, and 2000 for economic activity, land use, and water requirements resulting from estimates of recreational use.

The effects of foreseeable changes in economic structure are reported by Richard E. Lund in An Analysis of a Local Economy in a Period of Rapid Transition, Southwestern Wyoming.⁽¹⁹⁾ Primary data collection and study procedures are outlined in this report which studies basic changes in the economy of the region. The changes include: (1) closure of coal mines as a consequence of the railroad conversion to diesel locomotives, (2) development of a mineral discovery (Trona), and (3) a new

market for natural gas due to the construction of a pipeline through this natural gas-producing area.

An Interindustry Analysis of the Central New York Region, by Robert J. Kalter⁽²⁰⁾, uses employment as data rather than dollar value of transactions. This study shows the interdependence of the sectors in terms of employment changes in the sectors as the area grows.

A report by Bromley, Blanch and Stoevener on the Grant County, Oregon economy, Effects of Selected Changes in Federal Land Use on a Rural Economy,⁽²¹⁾ is concerned with the interdependency of the federal grazing land and the grazing industry. This study estimates the effects of two hypothetical changes, a reduction in federal grazing and an increase in output by the lumber sector. It also utilized primary data collection.

The input-output studies reported here are representative of many regional applications of the method. The next chapter will develop the model and illustrate with a hypothetical example the calculation of impacts and effects of changes in the final use (or export) sectors of the economy.

Notes for Chapter II

(1) Floyd K. Harmston and Richard E. Lund, Application of an Input-Output Framework to a Community Economic System (University of Missouri Studies, vol. XLII; Columbia, Mo.: University of Missouri Press, 1967), p.6.

(2) John R. Meyer, "Regional Economics: A Survey", American Economic Review, LIII, No. 1 (March, 1963), p. 19-54.

(3) Ibid., p.36.

(4) J. M. Henderson, The Efficiency of the Coal Industry: An Application of Linear Programming (Cambridge, Mass.: Harvard University Press, 1958).

(5) Hollis B. Chenery and Paul G. Clark, Inter-industry Economics (New York: Wiley, 1967), p.4.

(6) William H. Miernyk, The Elements of Input-Output Analysis (New York: Random House, 1965), p.4.

(7) Ibid.

(8) Ibid.

(9) Ibid., p.5.

(10) Wassily W. Leontief, "Quantitative Input-Output Relations in the Economic System of the United States," Review of Economics and Statistics, XVIII (August, 1936), p.105-125.

(11) Carl F. Christ, "A Review of Input-Output Analysis," Input-Output Analysis: An Appraisal, ed. Raymond W. Goldsmith (Studies in Income and Wealth, vol. 18; Princeton: Princeton University Press, 1955), p.168-169.

(12) Bibliographies include the following, as well as references to the literature found in works already cited:

Philip J. Bourque and Gerald Hansen, An Inventory of Regional Input-Output Studies in the United States (Occasional Paper, 17; Seattle: Graduate School of Business Administration, University of Washington, 1967).

Vera Riley and Robert Loring Allen, Inter-industry Economic Studies (Baltimore: Johns Hopkins Press, 1955).

C. E. Taskier, Input-Output Bibliography, 1960-1963 (Statistical Papers, Series M; New York: United Nations, 1964).

C. E. Taskier, Input-Output Bibliography, 1963-1966 (Statistical Papers, Series M; New York: U.N. Statistical Office, Dept. of Economic Affairs, 1967).

U.S. Bureau of the Budget, Interindustry Bibliography (Washington, D.C.: Government Printing Office, 1953).

(13) Hays B. Gamble, The Economic Structure of Sullivan County, Pennsylvania (Bulletin, 743; University Park, Pa.: Pennsylvania State University, College of Agriculture, Agricultural Experiment Station, 1967).

(14) Hays B. Gamble and David L. Raphael, A Micro-regional Analysis of Clinton County Pennsylvania (2 vols.; University Park, Pa.: Pennsylvania Regional Analysis Group, Pennsylvania State University, 1966).

(15) Ibid., v.2, p.6-19.

(16) John G. D. Carden and F. B. Whittington, Studies in the Economic Structure of the State of Mississippi (2 vols.; Jackson, Miss.: Mississippi Industrial and Technological Research Commission, 1964).

(17) Robert Loring Allen and Donald A. Watson, The Structure of the Oregon Economy: An Input/Output Study (Eugene, Ore.: Bureau of Business and Economic Research, University of Oregon, 1965).

(18) James R. Gray and Garrey E. Carruthers, Economic Impact of Recreational Developments in the Reserve Ranger District (Agricultural Experiment Station Bulletin 515; Los Cruces, N.M.: New Mexico State University, 1966).

(19) Richard E. Lund, An Analysis of a Local Economy in a Period of Rapid Transition, Southwestern Wyoming, (Prepared by the University of Wyoming College of Commerce and Industry under the Small Business Administration Management (Laramie, Wyo.: 1960).

(20) Robert J. Kalter, An Interindustry Analysis of Central New York Region (A.E. Res. 257; Ithaca, N.Y.: Dept. of Agricultural Economics, Cornell University Agricultural Experiment Station, 1968).

(21) D. W. Bromley, G. E. Blanch, and H. H. Stoevener, Effects of Selected Changes in Federal Land Use on a Rural Economy (Station Bulletin 604; Corvallis, Ore.: Agricultural Experiment Station, Oregon State University, 1968).

assumptions about economic behavior and an understanding of the relationships represented in the model. Abstraction is necessary in building a model not only to simplify it and permit its empirical implementation, but also to concentrate upon the variables relevant to the problem for which the model is built. It is abstraction which imposes limitations upon the model.

4. Money Flow in a Regional System

The input-output model for a regional economy as now being viewed the economy as a system of interconnected parts, with money flowing into the regional system from the sale of exports to the rest of the world and then circulating among the sectors until it again flows out of the region as a payment for an import. Figure 2 shows the general flow.

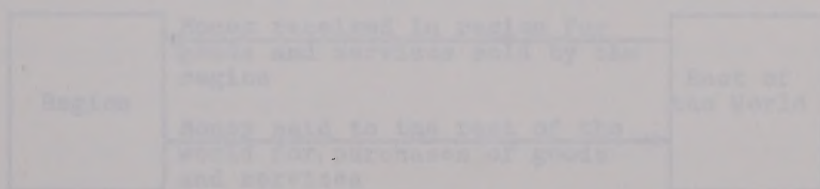


Figure 2
General Money Flow

CHAPTER III

THE INPUT-OUTPUT MODEL

To implement the input-output model, as with any model of economic activity, requires an acceptance of certain assumptions about economic behavior and an understanding of the relationships represented in the model. Abstraction is necessary in building a model not only to simplify it and permit its empirical implementation, but also to concentrate upon the variables relevant to the problems for which the model is built. It is abstraction which imposes limitations upon the model.

A. Money Flows in a Regional System

The input-output model for a regional economy as used here views the economy as a system of interconnected sectors, with money flowing into the regional system from the sale of exports to the rest of the world and then circulating among the sectors until it again flows out of the region as a payment for an import. Figure 2 shows the general flow.

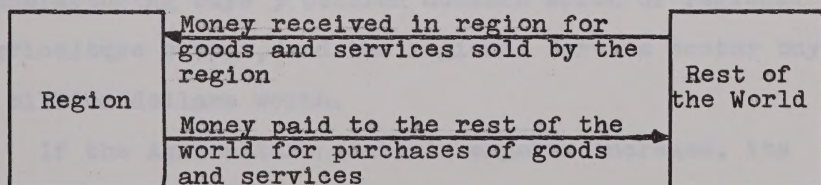


Figure 2
Regional Money Flow

Referring to the hypothetical example of an economy shown in Table 1, page 35, we can trace the flow of money through the system. The Agriculture sector receives 24 billion dollars from outside the system for exports, and 11 billion dollars for output sold within the system, a total output value of 35 billion dollars. This 35 billion dollars is, in turn, spent by the Agriculture sector for inputs necessary to produce that output. In our example, Agriculture purchased production inputs (a column) of 2 billion dollars from itself (feed grains, breeding cattle, seed, etc.), 4 billion dollars of manufactured goods (lumber, gas, machinery, fertilizer, etc.), and 1 billion dollars worth of services (tractor repairs, education, labor, etc.). It also bought 28 billion dollars worth of inputs from similar economic sectors outside the system (imports).

Agriculture sells some of its output to quadrant II sectors in the regional system, for their use as input. These sales are shown in the Agriculture output row. Manufacturing buys 5 billion dollars worth of regional Agriculture output, and the regional Service sector buys 4 billion dollars worth.

If the Agriculture sector's exports increase, its total output will increase, and its input purchases from Manufacturing and Service sectors will also increase.

This is the direct effect of increased sales. As Agriculture's activity increases, purchases of the output of the Manufacturing sector and Manufacturing's inputs will also increase. As Manufacturing's inputs increase, it will buy more from Agriculture and the other sectors. This circulation of income in the system is the direct and indirect effect of sales to buyers outside the system. The direct plus the indirect effects of a change in output level between any two sectors is called sector interdependency. It is measured in an array of coefficients called an inverse matrix.

The money received from exports by Agriculture does not recirculate in the system indefinitely. It "leaks" to the outside world through the purchase of imports.

The recirculation of money in the system is different for each pair of sectors, so the interdependency between the members of any pair is likely to be different. The purpose of input-output analysis is to measure this interdependency and use it to determine a consistent solution for a new equilibrium output level for each sector when the final use (export) of one or more sectors is changed.

The sales row total and purchase column total in a transactions table are defined as equal. This is plausible and follows from the definition that receipts for output

must equal the purchase cost of inputs since every transaction may be considered from two points of view, as a purchase or as a sale, and when all transactions are totalled, for a firm or a region, the receipts must equal the payments. A second interpretation of this equality is that system inputs and outputs must balance. Gamble and Raphael in their study of Clinton County⁽¹⁾ develop this regional balance-of-payments argument. They observe that a sub-national region in a modern economy exports in order to obtain "outside" money, which is used to buy outside goods. If the trade is not balanced, the regional money supply will either increase or decrease. An increase in money supply, once full employment is reached, will tend to cause inflationary pressure as internal activity is increased. Where imports exceed exports, money supply will decrease and lead to a decline of economic activity. In other words, the balance of payments for imports and exports is assumed to be in equilibrium in a healthy regional system.

B. Input-Output Accounting System - The Transactions Table

The input-output method of analysis is based upon a descriptive transactions table developed by a double-entry accounting procedure. The preceding discussion of money flows (into, through, and out of a system) is formalized

by the use of accounting definitions and categories. The transactions table includes, for a base period of time (usually one year) all the purchases and all the sales by all the economic units -- individuals, firms, and governments -- either among themselves or with the rest of the world. Here it is assumed that these units may be grouped together into sectors to reduce the table to manageable size and focus on those elements which are relevant to the purposes of the study (Assumption 1, page 44). The accounting definitions, comprehensive of all transactions and mutually exclusive, give meaning to the table.

The classification of transactions yields four categories or, following the terminology of Chenery-Clark, four quadrants.⁽²⁾ These quadrants and the symbolic notations used in them are shown in Appendix B. A simple illustrative example to be used in this discussion is shown in Table 1.

Table 1

Transactions Matrix (Billion Dollars)

		Purchases (Input Columns)					Total Use (Output)
		Endogenous Sectors				Exogenous	
		Intermediate Use of Output (Regional Use)				Final Use (Export Use)	
		Agri.	Mfg.	Svc.	Total	of Output	
Producer Sales (Output Rows)	Agriculture	Quadrant II :2 5 4: 11				Quadrant I :24:	35
	Manufacturing	:4 10 4: 18				:17:	35
	Services	:1 2 4: 7				:13:	20
							
	Total	7	17	12	36	54	90
Sales of Primary Inputs (Imports)		Quadrant III :28 18 8: 54				Quadrant IV :1:	55
Total Inputs		35	35	20	90	55	145

Selection of the sectors to be considered endogenous in the system is an important step in adapting the model to the user's purpose. Endogenous sectors are those which can be considered as having their activity level determined within the system (quadrant II) when the level of export is given. Each endogenous sector appears twice in the system, first as a purchaser of inputs (column) and second as a seller of outputs (row). Final use, or exogenous, sectors are the opposite. Their levels are determined outside of the system. Examples are nonlocal

government expenditures in the region and export sales. An export sale such as of wood products is determined, in part, by the national demand for housing.

Two transactions classifications may be used to separate endogenous sectors and exogenous sectors. The sectors may be classified on the basis of type of output use or by location of the using activity.

The use classification is employed to identify and distinguish intermediate use of goods and services by producers of other goods and services. The producers are grouped into endogenous sectors. Exogenous sectors of final users -- consumption by individuals, government, investment, and export -- may be determined by factors outside of the production system. The use classification may be applied in studies of areas which have a low level of trade with the rest of the world. Such application makes final use consumption and investment more clearly subject to variation by alternative policies.

The location classification is used to focus on the whole economic system of a region. It classifies sectors for their use of goods in the region of interest as endogenous, and sectors whose purchase level is determined outside the region as exogenous. Thus the location classification includes, in the endogenous sectors, final use purchases made by regional sectors. The location classification may be applied in regions which have high

trade levels with the rest of the world. Therefore, exports become a more important determinant of regional economic activity.

Quadrant I contains data on the exogenous use of the goods and services produced by each endogenous sector (row). In Table 1, quadrant I is shown as a single column, although it may include several columns. Quadrant I may be disaggregated by type of use, region of use, or any combination of these which is convenient for making estimates. For instance, the final use sales of manufacturing output in Table 1 is 17 billion dollars; this could be subdivided into foreign exports and exports to various domestic regions. Changed output demands of buyers outside the system are commonly used to express hypothesized or actual changes imposed upon the system. The total is then used in calculating the impact of the change -- i.e., the new output level for each sector. The use classification considers consumption, investment, government, and exports as non-producing final users whose expenditure level is assumed to be determined outside the production system.

Quadrant II consists of a system of producer sectors whose level of activity is determined by trade patterns and technical production relationships among the sectors. The quadrant consists of rows of output sales, one row

per sector, and columns of input purchases by the sectors. Each cell, the intersection of a pair of sectors, indicates the amount of output purchased by the column sector from the row sector. In the use classification, the system includes sectors which produce output for use by other producers as well as for final use. A quadrant II column total of inputs purchased from quadrant II sectors is frequently included to facilitate comparison with quadrant III inputs. Likewise, a quadrant II row total of output use by quadrant II sectors may be included to show its relationship to use by exogenous sectors and total use. In Table 1, the Manufacturing sector purchases 17 billion dollars of inputs from quadrant II and 18 billion dollars of inputs from quadrant III sources. Manufacturing's total receipts from sales to quadrant II sectors is 18 billion dollars, more than half of its total sales which were 35 billion dollars. It is quadrant II which is used to develop the inter-dependency coefficients (inverse matrix).

Quadrant III contains the inputs of the endogenous sectors which are not produced by them. In the use classification of transactions, the quadrant may include payments for labor, capital, non-local government, and imports.

The imports of produced goods may be shown in several

ways: (1) as a single row of sales to column sectors; (2) as a set of rows, perhaps one for each system sector, and an additional row for non-produced imports; or (3) rows by type of input by origin. In an alternative form of the model, imported produced inputs may be added directly to each appropriate cell in quadrants I and II rather than in quadrants III and IV. In this case, imports are then subtracted from total use (indicated output) of each sector to determine the total production (net output) of the system.

Quadrant IV consists of direct use of primary inputs by sectors outside of the system. In the use classification model, quadrant III may contain labor and imports as primary input sectors, and quadrant I may identify consumption and government as final use purchasing sectors. The use of labor service by government and domestic help by households are examples of quadrant IV entries.

When the focus of study is a regional economic system which has a high proportion of intermediate and final-use transactions crossing regional boundaries, a location classification of transactions may be used to study the effects of the trade on the regional economy. Intra-regional transactions by all regional sectors are considered as part of the system. The quadrant descriptions are revised for the location classification.

Quadrant I contains only exports: any sales of output outside the region, to a nonresident, or to a non-regional government. Quadrant II includes all regional buyers and sellers as sectors in the system. In this case, the term "producer" includes the regional producer and final use. Examples are local government and households, the latter producing labor services and using consumption goods as inputs. Quadrant III contains only import sectors, input purchases from non-regional sources which include factor earnings of non-residents, non-regional government, goods and services produced outside the region. When the location classification of transactions is used, it is not logical to use quadrant IV since only exports of imports would be applicable. The model developed in Chapter IV will use a regional, or location, classification.

Figure 3 shows four variations of the transactions table and model which result from the two classifications of transactions, by location and by use. It also shows these forms for two alternative treatments of imports. The location classification has the effect of moving some "final use" and corresponding "primary input" sectors into the producer quadrant (II), which then becomes the regional system quadrant. This is called "closing the open model", with respect to the sectors transferred.

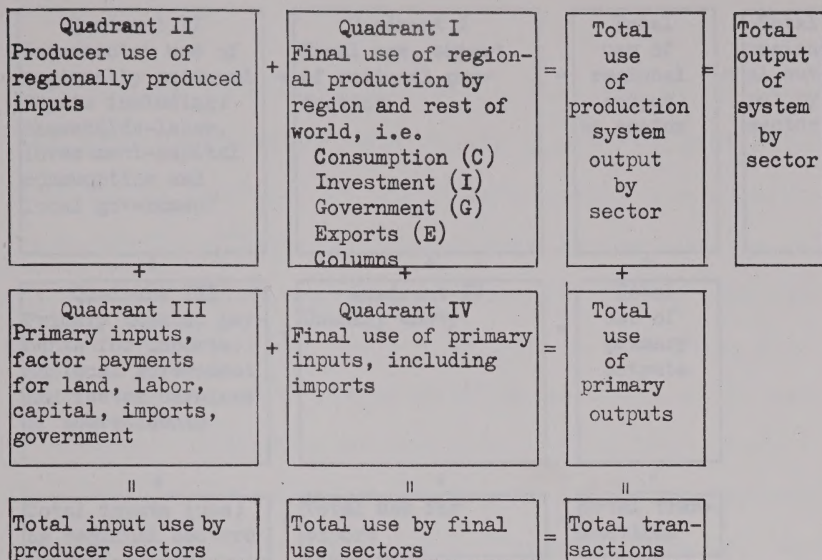


Figure 3 a
Some Variations of a Single Region Input-Output Model:
Transactions Classified by Use, Imports in Quadrant III.

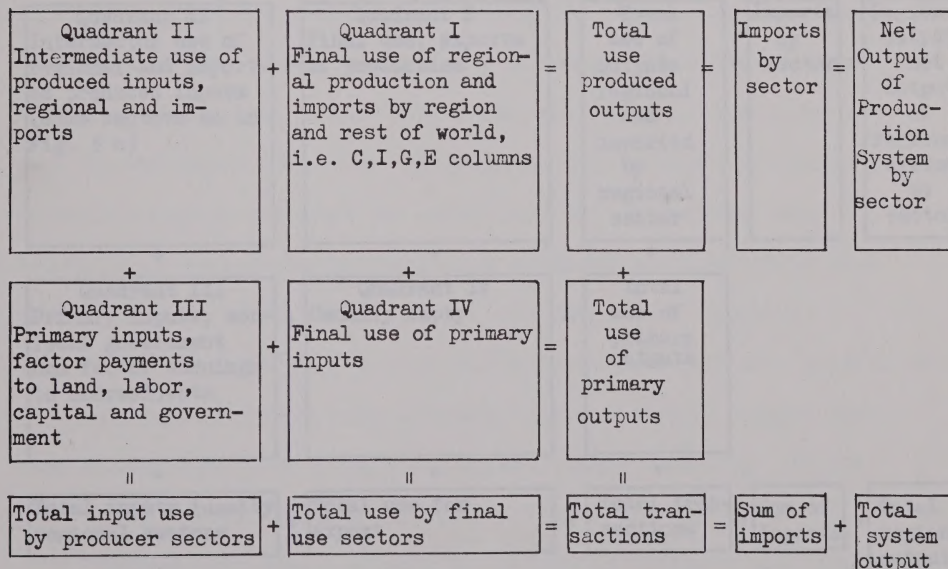


Figure 3 b
Transactions Classified by Use
Imports in Quadrants I and II and Deducted from Total Use.

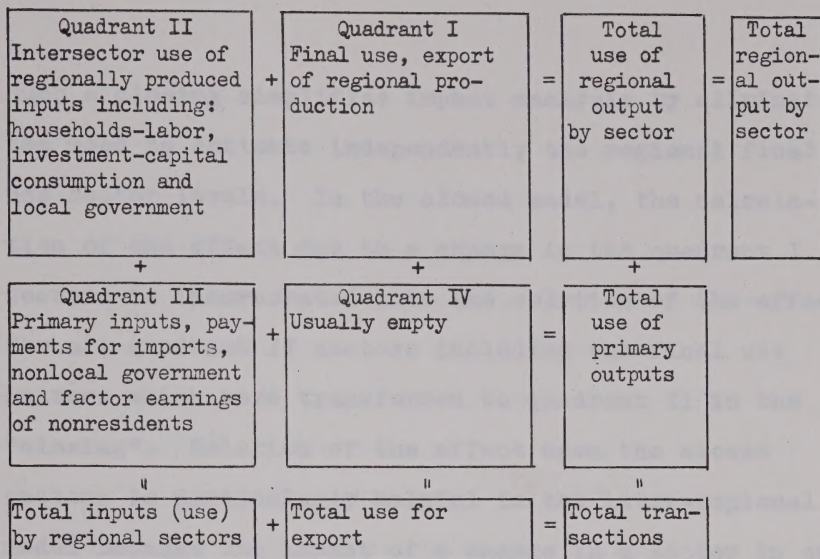


Figure 3 c
Transactions Classified by Regional Location
Imports as Primary Inputs, Quadrant III

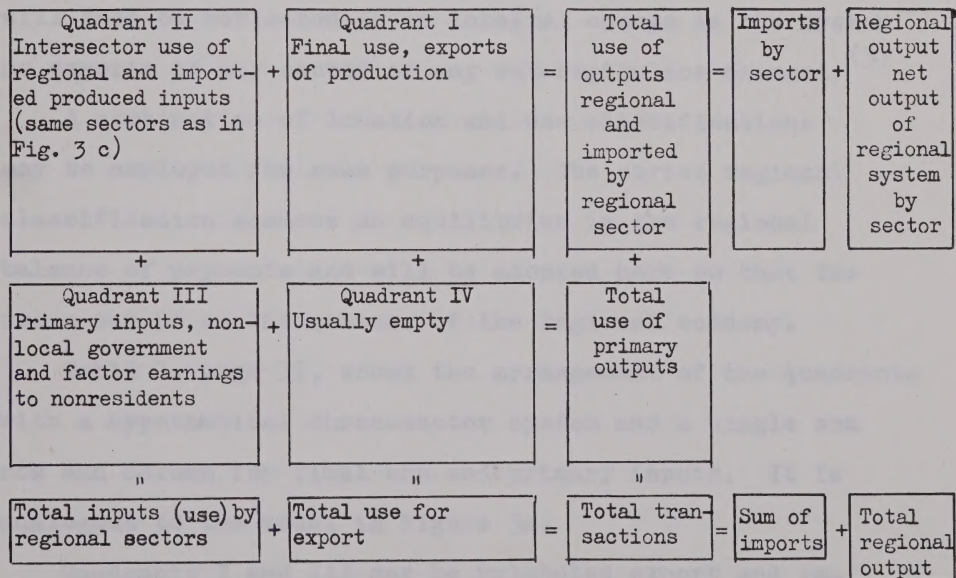


Figure 3 d
Transactions Classified by Regional Location
Imports Included in Quadrants I and II and Deducted from Total Use.

Such a closing simplifies impact analysis by eliminating the need to estimate independently the regional final use sector levels. In the closed model, the calculation of the effect due to a change in the quadrant I sectors is incorporated into the solution of the effect for all quadrant II sectors including the final use sectors which were transferred to quadrant II in the "closing". Solution of the effect upon the closed sectors is particularly helpful in the inter-regional model because the impact of a change in a sector in one region will be reflected in the closed sectors in other regions. Changes in consumption in the sub-regions will then be reflected as an integral change in the system as exports of any sector or any sub-region are changed. ⁽³⁾

A combination of location and use classifications may be employed for some purposes. The strict regional classification assumes an equilibrium in the regional balance of payments and will be adopted here so that the focus can be on the sectors of the regional economy.

Table 1, page 35, shows the arrangement of the quadrants with a hypothetical three-sector system and a single sum row and column for final use and primary inputs. It is analogous to the model in Figure 3a.

Quadrants I and III may be relabeled export and import, and the model closed to eliminate quadrant IV, to

conform with the regional model of Figure 3c. The use classification is utilized in the table and the example to illustrate the role of quadrant IV.

C. Assumptions of the Input-Output Method

Assumptions are made to permit empirical implementation of the input-output method and the working of the model. These assumptions are stated here in summary and, as listed, represent a somewhat arbitrary separation of points, since they are heavily inter-dependent.⁽⁴⁾

1. It is possible to aggregate economic units (individuals, firms, and governments) into sectors, each of which can be assumed to have a single production function, linear, homogeneous, and with no substitution of inputs. A linear production function implies that there are constant returns to scale.
2. There are no joint products. Only one sector produces a given type of output, and each sector produces only one product output. This assumption is less restrictive as the number of sectors (and therefore the number of products) increases.
3. Input proportions are constant for each sector; input level varies only with the output of the sector, and there are no inputs when there is no output. That is to say, the production function

is linear and homogeneous, as in Figure 4a.

4. Technology is fixed. This assumption rejects the possibility that technological change will affect the input proportions of the sectors. Where technological change may be estimated, adjustment of the transaction or coefficient arrays may be used to reduce the effects of this assumption.
5. The economic system is in equilibrium at the time of and after measurement of the transactions, and prices remain constant during the period to which the model is applied.
6. For the inter-regional form of the model, trade by each industry between sub-regions and trade by each sector with the rest of the world occur in fixed proportions, unaffected by the level of activity.
7. For the inter-regional model, transportation capacity is adequate to prevent changes in trade proportions. (If transportation systems were inadequate, an increase of output and shipments might result in a transportation-cost change and a tendency to change trade patterns.)
8. System inputs equal system outputs, sector by sector; that is, transactions summed by sales or

by purchases are equal.

9. The total system is equal to the sum of its parts; that is, there are no economies or diseconomies as the transaction level changes.

Data collection, sector aggregation, sub-regional areas selected, technological-change forecasts, and the form of the model can all be carefully manipulated to control and minimize the restrictions that these assumptions place upon the model.

D. The Input-Output Model

The assumptions, particularly the third and the eighth, permit conversion of the descriptive transactions matrix into an analytical model of the economic system. The model is used to forecast the direct and indirect effect upon the total output of each quadrant II sector due to a change in quadrant I use of output. The direct effect on quadrant II sectors is portrayed in an input ratio array. The total effect is found mathematically. It is in essence the transactions' activity of a chain of effects. This chain of direct spending by quadrant I sectors and responding by quadrant II sectors continues in quadrant II until the money is "leaked" out to quadrant III for import purchases. An input coefficient matrix is an array of input proportions for quadrant II sectors, indicating the direct effect upon quadrant II sectors

stated in cents per dollar of sales to a quadrant I sector. The inverse matrix is an array of coefficients for quadrant II sectors, indicating both direct and indirect economic effects for these sectors from each dollar of output sales to quadrant I sectors.

The regional economy is aggregated into $h + 1$ sectors. There are h regional sectors and the aggregated ($h + 1$) sector (Y_1) which is the total of the final use (export) sectors. This is shown in the notation of Appendix B, Table 6, as a system for quadrants II and I.

The output equation for row sector i is:

$$(1) \quad \sum_{j=a}^h x_{ij} + Y_i = X_i \quad (i=a\dots h)$$

When imports are included in quadrants I and II, the output equation becomes:

$$(2) \quad \sum_{j=a}^h x_{ij} + Y_i = Z_i = M_i + X_i \quad (i=a\dots h)$$

where Z_i = total use of sector i output; M_i represents total imports by sector i ; and X_i is the net output of sector i .

Equation (1) may be rewritten as the linear equation system (3) of h equations, one for each endogenous sector,

where i denotes the selling sector row and j denotes the purchasing sector column:

	Quadrant II		Quadrant I		Total Use
	$x_{aa} \dots + x_{1j} \dots + x_{1h}$		$+ Y_1$	$=$	X_1
	$\vdots$		$\vdots$		
(3)	$x_{1i} \dots + x_{1j} \dots + x_{1h}$		$+ Y_1$	$=$	X_1
	$\vdots$		$\vdots$		
	$x_{ha} \dots + x_{hj} \dots + x_{hh}$		$+ Y_h$	$=$	X_h

Equation (3') is equation system (3) rewritten with output equations from Table 1:

	(2	+ 5	+ 4)	+ 24	=	35
(3')	(4	+10	+ 4)	+ 17	=	35
	(1	+ 2	+ 4)	+ 3	=	20

Quadrants I and II of the transactions table appear in this system of equations. Quadrants III and IV do not directly enter into the solution of the set of output equations but do help to maintain balanced and internally consistent accounts.

The x_{ij} input values are transformed to proportions of total input by dividing each quadrant II entry (x_{ij}) by the total input; purchases of sector j , column total X_j , by using assumption 3.

Therefore, columns of expenditures for inputs by a regional sector can be converted to columns of proportions known variously as technical coefficients, trade

coefficients, or marginal input coefficients. The term input coefficient is descriptive of assumption 3, indicating the cents of direct effect on each quadrant II sector per dollar of output sold outside the system.

The general form of a linear equation is $y = a + bx$ and in the notation of Appendix B, Table 6, is:

$$(4) \quad x_{1j} = \bar{x}_{1j} + a_{1j}X_j$$

By assumption 3, $\bar{x}_{1j}$ is equal to 0, giving equation:

$$(4') \quad x_{1j} = a_{1j}X_j$$

where both sides are arrays of quadrant II.

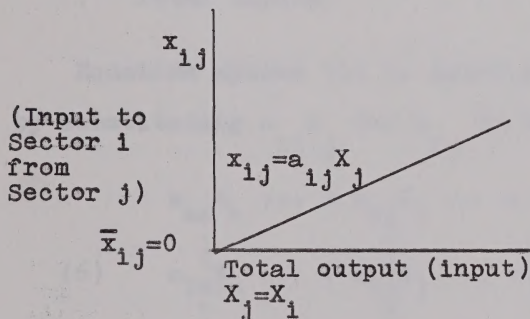


Figure 4a
Linear Homogeneous
Equation Estimate of
Production Function

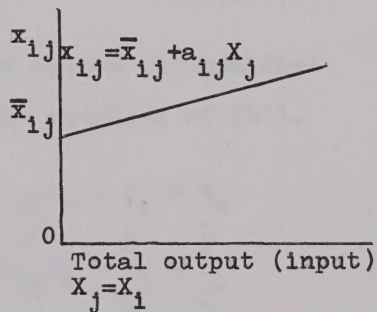


Figure 4b
Linear Nonhomogeneous
Equation Estimate of
Production Function

The coefficients for direct flow of final-use dollars through the system (quadrant II) are shown in equation (5), where purchases X_j , which equal sales X_1 , are used to calculate the coefficients.

$$(5) \quad \frac{x_{1j}}{x_j} = a_{1j}$$

where a_{1j} is the quadrant II input coefficient notation.

Input coefficients for the Agriculture sector in our example, Table 1, are shown in equation (5'):

	x_{11}/x_1	2/35=.058
Quadrant II rows:	x_{21}/x_1	4/35=.114
(5')	x_{31}/x_1	1/35=.028
Total produced inputs (quadrant II):	7/35=.200	
Primary inputs (quadrant III):	28/35=.800	
Total inputs:	35/35=1.000	

Equation system (6) is equation system (3) modified by substituting $a_{ij} X_j$ for x_{ij} by the equality of (4').

$$(6) \quad \begin{array}{l} a_{aa} X_a \dots + a_{aj} X_j \dots + a_{ah} X_h + Y_a = X_a \\ \vdots \\ a_{ia} X_a \dots + a_{ij} X_j \dots + a_{ih} X_h + Y_i = X_i \\ \vdots \\ a_{ha} X_a \dots + a_{hj} X_j \dots + a_{hh} X_h + Y_h = X_h \end{array}$$

Where in our example, $a=1$ and $h=3$, equation (6) may be re-written in numerical terms with coefficients from Table 2b and expressed as:

$$(6') \quad \begin{array}{l} .058(35) + .143(35) + .200(20) + 24 = 35 \\ .114(35) + .286(35) + .200(20) + 17 = 35 \\ .028(35) + .057(35) + .200(20) + 13 = 20 \end{array}$$

Tables 2a and 2b show the calculation of a matrix of input coefficients which completed the illustration of equation sets (5) and (5') of the transactions data of Table 1. The total quadrant II row and the primary inputs row are not used in the solution for the new equilibrium of output.

The calculation of the first four stages of the effects of a change in the final use (export) level of Table 1 is shown in Table 3, using the input coefficients of Table 2b. A forecast of the impact resulting from increased final demand of all three sectors is hypothesized to be increased by 10 billion dollars, changing Agriculture from \$24 billions to \$34 billions, etc., continuing through the Manufacturing and Service sectors. The problem, then, is to find the direct and indirect effects and the new total output of each sector.

The reasoning behind the method of determining impact is that as Manufacturing output increases, the inputs of Manufacturing will increase as well (assumption 3). For example, a lumber mill will buy more logs from land owners and more services from households, business, repair shops, etc., as export of its output increases. The preceding is called "round one". The second round of impact comes as a result of meeting the increase in output calculated for each sector in round one. This is repeated

Table 2 a
Transactions Table Converted to
Input Ratios by Buyers or Groups of Buyers of Inputs

		Purchases (Input Columns)					
		Agri.	Mfg.	Svc.	Total Intermed.	Final Use	Total Use
Producer Sales	Agriculture	2/35	5/35	4/20	11/90	24/55	35/145
	Manufacturing	4/35	10/35	4/20	18/90	17/55	35/145
	Service	1/35	2/35	4/20	7/90	13/55	20/145
	Total	7/35	17/35	12/20	36/90	54/55	90/145
Primary Inputs		28/35	18/35	8/20	54/90	1/55	55/145
Total Inputs		35/35	35/35	20/20	90/90	55/55	145/145

Table 2 b

Quadrant II, Input Coefficients of Endogenous Sectors

(a_{ij} 's of Quadrant II and Equation System (6) or the A Matrix of Equation (11))

Decimal Form			Quadrant II of Table 3a Symbolic Coefficients (a_{ij}) of Equation System			Input Coefficient Matrix	
.058	.143	.200	=	a_{11}	a_{12}	a_{13}	= A
.114	.286	.200		a_{21}	a_{22}	a_{23}	
.028	.057	.200		a_{31}	a_{32}	a_{33}	

Two Methods for Calculating Sequential Increases in Intermediate Use for a New Set of Final Use Levels
(Additional Inputs in Billions of Dollars)

* Input coefficients from Table 2.

Table 3 -- Continued

Two Methods for Calculating Sequential Increases in Intermediate Use for a New Set of Final Use Levels
(Additional Inputs in Billions of Dollars)

Method 1: Columns of Inputs					Method 2: Rows of Output				
Input Coefficient*	Output Increment	Additional Input by			Input Coefficient*	Output Increment	Additional Input by		
		Agri.	Mfg.	Svc.			Agri.	Mfg.	Svc.
ROUND 3									
Agri.to Agri.	.058 x 4.2	.2			Agri.to Agri.	.058 x 4.2	.2		
Mfg. to Agri.	.114 x 4.2		.5		Agri.to Mfg.	.143 x 7.1	1.0		
Svc. to Agri.	.028 x 4.2			.1	Agri.to Svc.	.200 x 2.6	.7		
Agri.to Mfg.	.143 x 7.1	1.0			Mfg. to Agri.	.114 x 4.2		.5	
Mfg. to Mfg.	.286 x 7.1		2.0		Mfg. to Mfg.	.286 x 7.1		2.0	
Svc. to Mfg.	.057 x 7.1			.4	Mfg. to Svc.	.200 x 2.6		.7	
Agri.to Svc.	.200 x 2.6	.7			Svc. to Agri.	.028 x 4.2			.1
Mfg. to Svc.	.200 x 2.6		.7		Svc. to Mfg.	.057 x 7.1			.4
Svc. to Svc.	.200 x 2.6			.7	Svc. to Svc.	.200 x 2.6			.7
Round 3 Increase		1.9	3.2	1.2			1.9	3.2	1.2
Due to Round 2 increase									
ROUND 4									
Agri.to Agri.	.058 x 1.9	.1			Agri.to Agri.	.058 x 1.9	.1		
Mfg. to Agri.	.114 x 1.9		.2		Agri.to Mfg.	.143 x 3.2	.5		
Svc. to Agri.	.028 x 1.9			.1	Agri.to Svc.	.200 x 1.2	.2		
Agri.to Mfg.	.143 x 3.2	.5			Mfg. to Agri.	.114 x 1.9		.2	
Mfg. to Mfg.	.286 x 3.2		.1		Mfg. to Mfg.	.286 x 3.2		.1	
Svc. to Mfg.	.057 x 3.2			.2	Mfg. to Svc.	.200 x 1.2		.2	
Agri.to Svc.	.200 x 1.2	.2			Svc. to Agri.	.028 x 1.9			.1
Mfg. to Svc.	.200 x 1.2		.2		Svc. to Mfg.	.057 x 3.2			.2
Svc. to Svc.	.200 x 1.2			.2	Svc. to Svc.	.200 x 1.2			.2
Round 4 Increase		.8	.5	.5			.8	.5	.5
Due to Round 3 increase									

* Input coefficients from Table 2.

round by round, rapidly diminishing as the intermediate flow approaches a new level necessary to maintain the new final-use level, and thus gives a new total-output level.

Table 3 shows the equivalence of using the columns of input and the rows of internal or intermediate-use sales to endogenous sectors (as input).

Table 4 summarizes the new final use and the impact of the four rounds, and compares it with the solution for new total output, using the inverse matrix $(I-A)^{-1}$, which is the mathematical and practical solution for any real problem and requires the use of a computer. The diminishing impact of successive rounds and the approach to the infinite number of rounds represented by the inverse solution is apparent in this table.

Table 4 also compares the old total output with the new total output. The increase of 10 billion dollars in the final use of output of each endogenous sector is seen to have resulted in an increase in total output of not 10 but 16.8, 20.8, and 14.5 billion dollars for Agriculture, Manufacturing, and Service sectors, respectively. Thus the multiplier effects of the sectors vary.

Table 5 gives the mathematical solution, the inverse, of interdependency coefficients. Each cell of the inverse gives the direct and indirect effect in proportions, dollars of intermediate transactions for a dollar of

Table 4
Estimation of New Total Output by Sector Due to Direct and Indirect
Effects of the New Final Use by the "Rounds" Method
 (Billion Dollars)

Industry	Agriculture	Manufacturing	Service
Old final use	24.0	17.0	13.0
New final use	34.0	27.0	23.0
Effect round 1	10.4	16.2	7.0
2	4.2	7.1	1.6
3	1.9	3.2	1.2
4	<u>0.8</u>	<u>0.5</u>	<u>0.5</u>
Estimated effect	51.3	54.0	34.3
Mathematical solution* for effect (all rounds)	51.8	55.8	34.5
Original total input (Table 2)	35.0	35.0	20.0

* The inverse of the matrix is formed by subtracting the input coefficient matrix A (see Table 2) from the identity matrix. The inverse matrix is then multiplied by the new final-use column to give the new equilibrium value of total output.

Table 5
Direct and Indirect Activity Per Dollar of Exogenous Use, the Inverse of (I-A)

$(I - A) = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} - \begin{bmatrix} 2/35 & 5/35 & 4/20 \\ 4/35 & 10/35 & 4/20 \\ 1/35 & 2/35 & 4/20 \end{bmatrix} = \begin{bmatrix} 33/35 & -5/35 & -4/20 \\ -4/35 & 25/35 & -4/20 \\ -1/35 & -2/35 & 16/20 \end{bmatrix}$			
$(I - A) = \begin{bmatrix} .94285714 & -.14285714 & -.20000000 \\ -.11428571 & .71428571 & -.20000000 \\ -.02857142 & -.05714285 & .80000000 \end{bmatrix}$			
$\text{Inverse } (I - A)^{-1} = \begin{bmatrix} 1.10077021 & 0.24711168 & 0.33697047 \\ 0.19094994 & 1.47142232 & 0.41559691 \\ 0.05295250 & 0.11392810 & 1.29172015 \end{bmatrix}$			
Column total in inverse (Direct and indirect effects of a unit of exogenous Quadrant I income to the column sector)	1.34467255	1.83246210	2.04428753

change in the exogenous sector. The entries in one diagonal of the inverse are greater than one; they can be thought of as the sum of two components: First, 1.00, representing the dollar of exogenous sector demand and second, the excess above 1.00 representing the result of recirculation -- i.e., the indirect effect of a dollar of exogenous sector demand. The entries in the off-diagonal cells indicate the cents of recirculation effect for each pair of endogenous sectors. They may be interpreted as multipliers of a dollar of exogenous demand. The column total of the inverse matrix is the regional multiplier for the sector; this is the amount of regional trade activity generated by a dollar of export sales by recirculation in the region before it is spent to purchase imports and "leaks" out of the regional system as an import purchase by a regional sector.

This completes the examination of the transactions table and the accounting system variations used for its construction. The resulting forms of the model depend upon the choice of the transactions classification, whether by use or location. An attempt has been made to present the mathematical formulations necessary in as simplified a manner as possible, avoiding much of the more sophisticated forms of mathematics, such as matrix algebra. An expansion of this treatment of the mathematical

equations and matrices is summarized in Appendix B, Table 6.

E. Modification of the Model for Imports in Quadrants I and II

In a form of the model where imports are introduced into quadrants I and II (see Figures 3b and 3d, pages 41 and 42), rather than as primary inputs, the computation of production by the system must be modified. This may be done by subtracting imports from quadrant I exports (or final use) and using the net figure as the $h+1$ exogenous demand sector to determine total economic activity. It may also be done by subtracting import use from quadrants I and II, either as a total import column or cell by cell, thus separating total activity into regional trade and import trade activities, as in the model in Figures 3a and 3c. In the form of the model which does not separate imports in the quadrants (Figures 3b and 3d), let Z_i represent total use for the i^{th} sector and M_i represent imports of the i^{th} sector.

$$(7) \quad Z_i = X_i + M_i$$

A homogeneous function may be developed similar to the input coefficient equations (4) and (4'). The imports appear in equation (2) as M_i and shown as the sum of the imports of the h sectors in equation

$$(8) \quad M_i = \sum_{j=a}^n M_{ij}$$

These may be transformed into an array of import coefficients similar to equation (4') giving:

(9) $M_{ij} = m_{ij}X_i$, an array of imports included in quadrant II. The import function is also assumed to be homogeneous. Import coefficient elements, m_{ij} , are parts of quadrant II input coefficients in the Figure 3b and 3d forms of the model:

$$(10) \quad m_{ij} = \frac{M_{ij}}{X_j}, \text{ the equivalent of input coefficient}$$

equation (5), where imports are included in quadrant II as above and identified by measurement for each cell in quadrant II, the a_{ij} is the regional input coefficient, and the total input coefficient is $a_{ij} + m_{ij}$. Some models use the term a_{ij} to include both the a_{ij} and m_{ij} .

The import array of m_{ij} can be used to go from the model form of Figure 3c to the one in 3d. The elements m_{ij} in the import array appear totalled with the a_{ij} elements in quadrant II in the model of Figure 3d. They can appear in the Figure 3c model in quadrant III aggregated and in a single row or in an m_{ij} array, where the number of rows of inputs (i) equals the number of quadrant II sectors. When the m_{ij} appear in quadrant III

as an array, the model can be used to separate the regional effect (model of Figure 3c) from the total economic activity effect, which includes increased import activity, by adding the import array to the regional quadrant II (model of Figure 3d). This flexibility may be obtained for a low cost when original data are being collected for an inter-regional model. This will be discussed under the heading of data collection in Chapter V.

The investigator may choose to follow a location or use basis for classification or a mixture of the two, depending upon the purpose of the study. This study is more concerned with the effect on the regional system, including household effects, than with the system of production sectors. This, however, does not limit the use of the model to a regional quadrant II. Quadrant II column and row sectors may be moved back to quadrants I and III, respectively, from the transactions matrix, to form a mixed use-location classification model. Such a model might be useful for some analyses by the BLM or by other potential users of an input-output study, such as the State of Oregon. An example of such a reopening of the model might be the moving of the investment column to quadrant I and the capital consumption row to quadrant III, where a hypothesis about investment effect might be tested. The model may be closed further by taking some

non-regional government activity (such as a federal government veterans hospital) and including it in the regional system.

F. Inter-regional Input-Output Analysis

The most casual review of income, employment, population, and industry data, such as in Appendix C, Tables 8-22, indicates that western Oregon is comprised of sub-regions which are significantly different. By recognizing sub-regions, one can study their interactions. The sub-regions can be either economic sub-systems or administrative units. Quadrant II intersectoral inter-dependencies in a single area and inter-sub-regional inter-dependencies can be analyzed with the input-output model. (The additional assumptions of inter-regional input-output models were stated with the other assumptions of the model, pages 44-46). The inter-regional model permits consideration of geographical differences in production functions and identifies inter-regional trade patterns and inter-dependencies of industries and regions.

An inter-subregional model is shown in Table 6, where sub-regional quadrant II arrays of intersector transactions within the sub-regions appear on the northwest-southeast diagonal of an array of sub-regions. The off-diagonal arrays of transactions show trade between sub-

Table 6
Transactions Matrix Example for Inter-subregional and Regional Economic System
 (Inter-subregional Modification of Table 1)

Billions of Dollars

Purchasing sector Columns of Source inputs supply rows, Rows of output sales				Purchases by (Input columns)														
				Subregions 1...s (s=2)						Output of subregions and region by sector			Total endog- enous sector use	Total exog- enous sector use	Total use			
				Subregion 1			Subregion 2											
				Sectors			Sectors			Agri. Mfg. Svc.								
				Agri. Mfg. Svc.			Agri. Mfg. Svc.			Agri. Mfg. Svc.								
Sales by (Output sector rows)	Subregions 1..r (r=2)	Subregion 1	Sectors	Subregional Quadrant II														
				Agriculture			1.1 1.3 2.7			0.1 0.2 0.0			1.2 1.5 2.1			4.8	17.2	22
				Manufacturing			1.1 2.5 1.5			0.3 1.8 0.1			1.4 4.3 1.6			7.3	5.7	13
		Service			0.5 0.3 1.8			0.0 0.0 0.0			0.5 0.3 1.8			2.6	6.4	9		
		Subregion 2	Sectors	Agriculture			0.1 0.2 0.3			0.7 3.3 1.6			0.8 3.5 1.9			6.2	6.8	13
				Manufacturing			1.0 0.2 0.5			1.6 5.5 1.9			2.6 5.7 2.4			10.7	11.3	22
	Service			0.1 0.0 0.1			10.4 1.7 2.1			0.5 1.7 2.2			4.4	6.6	11			
	Total Regional Purchases	Sectors	Agriculture			1.2 1.5 2.4			0.8 3.5 1.6			2.0 5.0 4.0			11.0	24.0	35	
			Manufacturing			2.1 2.7 2.0			1.9 7.3 2.0			4.0 10.0 4.0			18.0	17.0	35	
			Service			0.6 0.3 1.9			0.4 1.7 2.1			1.0 2.0 4.0			7.0	13.0	20	
Total Endogenous sector use				3.9 4.5 6.3			3.1 12.5 5.7			7.0 17.0 12.0			36.0	54.0	90			
Total primary inputs				18.1 8.5 2.7			9.9 9.5 5.3			28.0 18.0 8.0			54.0	1.0	55			
Total inputs				22.0 13.0 9.0			13.0 22.0 11.0			35.0 35.0 20.0			90.0	55.0	145			

Subregional Quadrant II

Regional Quadrant I, the aggregated subregions

regions. The bottom row of arrays of sectors shows total purchases in the region by sectors of a sub-region. A right-hand column of arrays of sectors shows the total output sold in the region by each sector by sub-region. The intersecting array of regional inputs and outputs by sub-region is the regrouped regional quadrant II.

The two-region scheme of Table 6 may be extended to a greater number of sub-regions. The sub-regions may be aggregated or partially aggregated into the region or larger sub-regions when the sectors of the sub-regions are identical in number and kind.

Referring to Table 6 for an example of inter-subregional trade, the Manufacturing sector of sub-region 2 buys .2 billion dollars worth of output from the Agriculture sector of sub-region 1, or, as viewed by the selling sector, Agriculture in sub-region 1 sells .2 billion dollars worth of goods to the Manufacturing sector of sub-region 2. The input coefficients and interdependency (inverse) matrices may be calculated for both the inter-subregional quadrant II (four upper-left matrices of Table 6) and the regrouped regional matrix. The inter-subregional mathematical model measures direct and indirect effects as does the single-region model. That is, the input coefficient matrix gives the direct effect of a change in one or more final uses, and the

inverse (interdependency) matrix gives the total effects of a final-use change. Evaluation of an inter-regional model also reveals differences in importance of sectors in different sub-regions and the relative importance of regional and export sales. For instance, sub-region 1 in Table 6 is seen to be agriculturally oriented and to be selling about two-thirds of its output to export sectors. Sub-region 2 is more oriented to manufacturing and sells less (about 50 percent) of its output as exports (final use).

The inter-subregional form of the model requires the assumption of fixed inter-subregional trade as well as fixed inter-industry trade coefficients. There would seem to be less reason for trade stability between sub-regions than between industries. In the single-region model, input coefficients are sometimes called technical coefficients, with an implication of technically fixed inputs (for instance, steel, rubber, and glass inputs for the output of one car). Constant trade coefficients between regions might follow from uniformity of the sub-regional economies, a similar geographic advantage which might tend to minimize costs (for instance, most wood products manufactured in western Oregon are manufactured for export from western Oregon, a condition which is likely to persist).

Consider again the treatment of imports. They may be in quadrant II or III in the regional transactions classification in Figures 3c or 3d. Quadrant III may contain imports as one row or as "a to h" rows, one for each sector in a sub-region. As will be noted in Chapter V, a questionnaire to give the imports by "a to h" sectors in quadrant III is not unduly complicated in the inter-subregional model.

The model form of Figure 3d includes imports in quadrant II. Thus, a solution for a new total use of outputs includes changes in imports. This indicates that changed quadrant II use, and total use of output, requires an adjustment to remove the increased imports before the new net regional (or sub-regional) output can be determined. The Figure 3c model having only regional (sub-regional) transactions in quadrant II and imports in quadrant III gives regional (sub-regional) change directly, but does not indicate the change in total activity, because of the omission of imports.

The difference between a new total use, as determined by the two model forms including and excluding imports from quadrant II, and resulting from a hypothetical change in final demand would immediately give the change in imports by sector. The change in imports has value in identifying opportunities for new regional production.

Planning for regional development, by production of some of the increase in import sector activity, would require supplemental study for economic feasibility by Oregon agencies having special responsibilities in this area, and by the affected industries. The development opportunity aspect simply indicates one use not immediately evident to the forest manager but having a bearing upon the best form of the model and perhaps on the "best" decision by forest managers.

Notes for Chapter III

- (1) Hays B. Gamble and David L. Raphael, A Micro-regional Analysis of Clinton County Pennsylvania (2 vols.; University Park, Pa.: Pennsylvania Regional Analysis Group, Pennsylvania State University, 1966), v.2, p.30.
- (2) Hollis B. Chenery and Paul G. Clark, Interindustry Economics (New York: John Wiley & Sons, 1967), p.16.
- (3) Ibid., p.68.
- (4) Assumptions in input-output models are covered thoroughly in Chenery and Clark, op. cit., pp. 17, 22, 33-35, 39-42, 67, and 142.

CHAPTER IV

IDENTIFICATION OF ALTERNATIVE INPUT-

OUTPUT MODELS FOR BLM USE

This chapter will concentrate on the identification of two sector levels and their classification as regional or non-regional. The discussion will then turn to the grouping of the counties of western Oregon into sub-regions.

A. Criteria for Assigning Economic Units to Sectors

Sectors are groups of firms which are aggregated on the basis of some characteristic. Considering the assumptions of the input-output model, the ideal sector is achieved by grouping only firms with similar inputs, outputs and production processes. However, since some products may be made from more than one set of inputs and since some firms produce multiple products, this approach would require too many sectors to be practical.

One significant factor in the determination of sector formulation is the availability of secondary data for use in developing an input-output study. The Standard Industrial Classification system, SIC, used in the United States to classify economic units and compile economic statistics, distinguishes industries in terms of products (output), materials consumed (input), or processes of manufacture used.⁽¹⁾ The SIC also indicates that its

recognition of industries is based on several criteria, including the number of employees, value added by manufacture, value of shipments and the number of establishments.⁽²⁾ The majority of data available from trade associations, local, state, and federal government sources is based on the Standard Industrial Classification.

The SIC identifies industries at three levels using two, three and four digit codes, the detail increasing with the number of digits. Thus, even if the SIC is used, there is still the question of how many industries to group into a sector. The more industries, and hence firms, in a sector, the less reliable are the input coefficients derived in the analysis, since they are averages for the firms sampled.

Dr. Gerald J. Karaska, using sample data of an input-output study, has measured variation of input coefficients.⁽³⁾ His findings indicate that input coefficients vary most in a product type aggregation and tend to vary more as aggregation decreases the number of sectors.

The sectors listed below are based on the following criteria derived from the points brought out in the previous section and reflecting the purpose of the study. First, **SIC** groups engaged in supplying forest output or in making direct use of the forest resource will be

identified. Second, users of the output of the direct use sectors and suppliers of their nonforest inputs have an interaction and inter-dependency with the direct use groups and will be recognized generally at the SIC two digit level, with exceptions in the areas of greatest interest to the study. The interaction and inter-dependence of a tentative SIC grouping may be inferred by the input or inter-dependency matrices of completed studies. The coefficients from the 1958 national input-output model⁽⁴⁾ and from a 1963 Oregon model⁽⁵⁾ were considered in selecting the sectors proposed for the model being developed here. Third, to be recognized as a separate sector, an SIC grouping should be a significant part of the economy as indicated by employment, value added, payroll, number of establishments, sales or receipts. Employment data as an index of significance are convenient because they are more readily available than the others over a range of all types of firms. However, even employment data are incomplete for two reasons: (1) reported employment varies, being limited in some cases to employment covered by state unemployment insurance or to firms reporting on certain tax forms;*

*Such as 1967 County Business Patterns covering only employment covered by the Federal Insurance Contributions Act, which is approximately 68.4 percent of total paid civilian employment (p.iii).

(2) employment data vary in detail between sources and reporting areas. This may be the result, in some cases, of combining industry groups to conceal the operations of an individual firm. This problem increases as the size of the area decreases and as the number of sectors increases. Fourth, the number of sectors has a direct bearing on the cost of the study, and is a further restriction. Two alternative levels of detail and consequent cost will be set forth in Chapter V. The sectors listed below are for the greatest detail considered.

B. Sectoring of the Model

Table 7 lists the proposed sectors and the SIC groups included. It is based on Appendix C, Tables 20 and 21. Appendix C, Table 20 shows estimated employment by sector, county and county groups approximating BLM districts and gives some indication of the geographical distribution and significance of the sectors. The number of establishments is a guide to sample sizes and cost. Appendix C, Table 21, indicates the number of firms in each sector by employment size class. Appendix C, Table 20 is based largely on employment data covered by Oregon unemployment insurance and unemployment compensation for federal employees.⁽⁶⁾ The data sources omit part or all of the employment in certain areas of activity such as railroads, self employment, agriculture, non-profit

Table 7
Proposed Sectoring

Sector Number	Name	Includes SIC Groups (1967 Manual)
Regional (Endogenous) Sectors, Quadrant II		
1	Agriculture, Fisheries	01, 07 (except 0722), 09, 084, 086
2	Forestry, except Government	08 (except 084, 086)
3	Mining & Quarrying	10, 12, 13, 14
4	Building Construction	part 15, part 17
5	Heavy Construction	part 16
6	Maintenance and Repair Construction	part 15, part 16, part 17
7	Food Processing	20
8	Logging	241
9	Sawmills and Planing Mills	242
10	Veneer and Plywood	243
11	Lumber and Wood Products NEC*	24 NEC*
12	Furniture and Fixtures	25
13	Pulp and Paper Mills	26
14	Printing and Publishing	27
15	Non Metal Manufacturing NEC*	22, 23, 28 (except 2819), 29, 30, 31
16	Stone, Clay and Glass Products	32
17	Primary Nonferrous Metal Manufacturing	2819, 333, 334, 335, 336, 3392
18	Fabricated Metal	34
19	Machinery (Except Electrical)	35
20	Electrical Equipment	36
21	Manufacturing NEC*	19, 331, 332, 3391, 3399, 37, 38, 39
22	Rail Transport	40
23	Transport NEC*	41, 45, 46, 47
24	Motor Freight Transport & Warehousing	42
25	Water Transportation	44
26	Communications	48
27	Electric, Gas and Sanitary Services	49
28	Lumber & Construction Material Wholesale	5098
29	Wholesale NEC*	50 NEC*
30	Food Retail	54
31	Automotive Retail	55
32	Eating and Drinking Places	58
33	Retail NEC*	52, 53, 56, 57, 59
34	Finance, Insurance, Real Estate	60, 61, 62, 63, 64, 65, 66, 67
35	Hotels and Other Lodging	70
36	Services NEC*	72, 76, 78, 79, 84, 86, 88
37	Miscellaneous Business Services and Legal Services	73, 81, 89

*NEC = Not Elsewhere Classified

Table 7 Continued
Proposed Sectoring

Sector Number	Name	Includes SIC Groups (1967 Manual)
38	Auto Repair Service	75
39	Medical, Health, Educational Services	0722, 80, 82
40	Households	—
41	State Government, Except Education	92
42	Local Government, Except Education	part 93
43	County Government,	part 93
44	Investment: Earnings—Depletion	—

Export (Exogenous) Sectors, Quadrant I (Columns)

45	Bureau of Land Management	part 9108
46	Forest Service	part 9108
47	Federal Government NEC*	91 NEC*, 94
48	Foreign Export	—
49	Domestic Export	—
50	Nonresident Purchases, Exports	—

Input Sectors, Quadrant III (Rows)

45	Bureau of Land Management
46	Forest Service
47	Federal Government NEC*
48	Produced Imports
49	Nonresident Factor Earnings

* NEC = Not Elsewhere Classified

organizations, state and public schools, local governments, real estate brokerages, and insurance agencies. Some adjustments for these omissions in the primary source have been made, using other employment statistics. Appendix C, Table 22 compares the adjusted employment in Appendix C, Table 20 and the total employment given in Appendix C, Table 9. The differences in employment shown in these tables are probably to be found in government sectors, non-profit organizations (Sector 36) and in unallocated self employment. It is assumed that refined employment data would not cause a change in the sectoring.

Appendix C, Table 20 also shows the number of firms by employment size class and sector for Oregon. This data is not available in adequate industry detail for individual counties. The number of firms by employment size class are used in developing cost estimates in Chapter V.

Two levels of sectoring are advanced, as illustrated in Figure 5, page 75. The two 50 sector studies provide more precision than the 33 sector studies but at a higher cost. For instance, in the 33 sector studies, the grouping of transportation sectors, to the extent that the distinctions between rail, truck and all other means of transportation are lost, could mask significant interdependencies between certain modes of transportation and

Proposed 50 Sectors Name	No.	Reduction to 33 Sectors	No.
Agriculture, Fisheries	1		1
Forestry, except Government	2		
Mining & Quarrying	3		2
Building Construction	4		3
Heavy Construction	5		
Maintenance and Repair Construction	6		4
Food Processing	7		5
Logging	8		6
Sawmills and Planing Mills	9		7
Veneer and Plywood	10		8
Lumber and Wood Products NEC*	11		9
Furniture and Fixtures	12		10
Pulp and Paper Mills	13		11
Printing and Publishing	14		12
Non Metal Manufacturing NEC*	15		13
Stone, Clay and Glass Products	16		14
Primary Nonferrous Metal Manufacturing	17		15
Fabricated Metal	18		16
Machinery (except Electrical)	19		17
Electrical Equipment	20		18
Manufacturing NEC*	21		19
Rail Transport	22		
Transport NEC*	23		
Motor Freight Transport & Warehousing	24		20
Water Transportation	25		
Communications	26		
Electric, Gas and Sanitary Services	27		21
Lumber & Construction Material Wholesale	28		
Wholesale NEC*	29		22
Food Retail	30		
Automotive Retail	31		
Eating and Drinking Places	32		23
Retail NEC*	33		
Finance, Insurance, Real Estate	34		
Hotels and Other Lodging	35		24
Services NEC*	36		
Miscellaneous Business Services and Legal Services	37		25
Auto Repair Service	38		26
Medical, Health, Educational Services	39		
Households	40		27
State Government, except Education	41		28
Local Government, except Education	42		29
County Government	43		30
Investment: Earnings-Depletion	44		31
Bureau of Land Management	45		
Forest Service	46		32
Federal Government NEC*	47		
Foreign Export	48		
Domestic Export	49		33
Nonresident Purchases, Exports	50		
Bureau of Land Management	45		
Forest Service	46		32
Federal Government NEC*	47		
Produced Imports	48		
Nonresident Factor Earnings	49		33

Figure 2
Two Levels of Sector Aggregation

* NEC = Not Elsewhere Classified

the forest industry sectors. Retail and service sectors are also reduced in the 33 sector level. These are identified in greater detail in the 50 sector level to permit consideration of the inter-subregional consumer trade and nonresident purchasing. A reduction in export sectors groups all federal government purchases into one sector and all other export sales into another. Imports are similarly grouped into purchases from the federal government and other imports. The BLM sector is grouped with the other federal government sectors in this consolidation. These examples illustrate the loss of detail in the reduced sector level.

Brief remarks about some of the sectors follow.

Sector 1: Agriculture and Fisheries - About three-fourths of all farm employment and eighty percent of farm income is in the Salem sub-region.

Sector 2: Forestry, Except Government - Forestry consultants and timber tract operations not elsewhere classified are included in this sector.

Sector 3: Mining and Quarrying - All mining and quarrying is combined since crushed stone, sand, and gravel are dominant. Metal and other mining are relatively insignificant. The road construction activity of the BLM would affect this sector.

Sector 4: Building Construction - Building construc-

tion is separated from heavy construction. This sector includes general contractors and special trade contractors primarily engaged in new construction of residential, farm, industrial, commercial and public buildings. New construction by Sectors 4 and 5 may be considered as investment spending.

Sector 5: Heavy Construction - This sector includes general contractors primarily engaged in new highway, bridge, railroad, flood control, marine construction and other non-building construction. Road construction by the BLM might be purchased from this sector.

Sector 6: Maintenance and Repair Construction - A repair construction sector is identified to separate investment classed as new construction from construction which is not an investment.

Sectors 7 through 23 include all the manufacturing activity of the system.

Sector 8: Logging - This sector is a direct purchaser of BLM timber and includes operations primarily engaged in cutting timber. Logging and woods operations by firms engaged in wood processing are assigned according to their primary function. Independent truckers of timber are classified as part of Motor Freight Transportation, Sector 23. Vertical integration in the wood using industry may obscure detail in this sector. Data collection

by operating establishment, rather than by whole firms, may reduce the error in this sector.

Sector 10: Veneer and Plywood - This sector includes establishments primarily engaged in millwork, and pre-fabrication of wooden buildings and structural members. About 90 percent of the value added in this sector is by its veneer and plywood component.

Sector 13: Pulp and Paper Mills - This sector includes pulp and paper mills and paperboard mills. Early sectoring plans separated these, but a low number of mills in some categories indicated the advisability of the single sector, which is adopted here.

Sector 17: Primary Nonferrous Metals - This sector includes the alumina part of the chemical group and the primary smelting, refining, rolling and foundry casting of nonferrous metals. Allen and Watson indicate that this sector ranks third in net trade balance as an exporter of 150 million dollars worth of products. ⁽⁷⁾

Sector 24: Motor Freight Transport and Warehousing - This sector includes many firms engaged in the trucking of timber.

Sector 25: Water Transportation - Firms primarily engaged in freight and passenger transportation on inland or open sea and furnishing incidental services to such transportation are included in this sector. This sector

is identified because of its relation to the question of policy about export of forest products.

Sector 28: Lumber and Construction Materials Wholesale - This sector is separated from other wholesale goods because it follows the sale and probably export from the region of the forest products industry. It constitutes about 15 percent of all wholesale sales.

Sectors 30 through 33: Retail Trade - These four sectors include establishments engaged in selling merchandise for personal, household or farm consumption. These sectors are recognized (in part) so that a change in nonresident tourist purchases or trade between subregions might be introduced in an impact analysis. The significance of these sectors and the validity of their recognition may be argued. They are not grouped into fewer sectors because they separate large groups of establishments with varying input patterns.

Sector 35: Hotels and Lodging; and Sector 38: Auto Repair Service - The same consideration as discussed for the retail sectors leads (in part) to the identification of these service sectors.

Sector 40: Households - This sector is considered to be composed of establishments primarily engaged in providing labor service inputs to other sectors and requiring inputs of consumption goods. The inclusion of this sector in quadrant II as an endogenous sector permits

direct forecasting of export level change impacts upon households.

Sector 41: State Government, Except Education -

This sector includes both administrative government and state government goods and service enterprises (hospitals, etc.). State tax receipts from outside the region would be classed as exports, and expenditures outside of the region as imports. State facilities operating to provide business-like services may be separated as another sector, but are not in this plan.

Sector 43: County Government - This sector is

separated from other local governments so that the impact of BLM programs can be related to county governments, many of which receive a substantial share of their total revenue from the BLM (See Appendix C, Table 12, columns 16 through 21). This is particularly evident in the southern parts of the region.

Sector 44: Investment -- Earnings Depletion - This

sector is derived following an approach used by Gamble and Raphael.⁽⁸⁾ The sector balances the row and column data of the model; the column (investment) shows expenditures for private fixed capital and inventory increases but does not include building investment which is in Sector 4. If the investment expenditures are greater than receipts (current net inflow is negative) and results

in a loss, this amount is introduced into the model to balance the sector. This procedure implies that an external investment has been made in the economy of the region. The corresponding row (earnings and depletion) records, as an inputs, the savings of households, retained earnings of local enterprises, use of inventory accumulated in a previous period, and capital consumption.

Sectors 45 through 50 are the column sectors of quadrant I which are defined as having their activity level determined outside the regional system. They supply new money inflow into the regional economy.

Sector 45: Bureau of Land Management - The BLM appears as a quadrant I sector column purchasing its inputs and making payments to regional sectors: households, county government and, indirectly, contractors building BLM roads. The BLM appears also in quadrant III as an import sector receiving payments from regional sectors.

Sector 47: Federal Government, NEC - This sector (as a column) buys the outputs of regional sectors (rows) such as direct contract purchase of wood products or as a subsidy for wheat, a grant to local government, or as a transfer payment to households (veteran's benefits or social security).

An alternative treatment would separate some federal

activities as a separate regional sector. These activities might include the Post Office, Veteran's Hospital and other essentially nonadministrative public services. This sector also appears in quadrant III where it includes the receipts of the federal government, not elsewhere classified, which are paid by regional sectors. Income, corporate and other federal taxes would be examples of these payments, and may be viewed as the regional share of purchases by national defense and other national programs.

Sector 48: Foreign Export - This column sector includes purchases of regional output by buyers outside the United States. This, for instance, could indicate sales by forest industry sectors to foreign buyers and permit investigation of the economic impact of such sales on the region.

Sector 49: Domestic Export - This column sector includes purchases of regional output by United States buyers outside of the western Oregon region.

Sector 50: Nonresident Purchases - A column of sales to nonresidents who purchase from sectors of the region are considered exports. Recreation expenditure changes occasioned by hypothesizing a new national park might be investigated by using such a sector.

Sectors 48 through 50 are redefined and appear in

quadrant III as row sectors 48 and 49.

Sector 48: Produced Imports - Imports not elsewhere identified may be shown here in a single row. When imports are disaggregated into sectors equivalent to those in quadrant II, they would appear as 44 rows, eliminating this sector.

Sector 49: Nonresident Factor Earnings - This row includes payments by the endogenous regional sector for nonregional labor, stock dividends, or payments for capital invested by nonresidents. If the import array in quadrant III is adopted, this row would be incorporated into the 44 rows described in Sector 48 above.

C. Delineation of Sub-Regions of Western Oregon

Sub-regions for the inter-regional input-output model will be formed by grouping counties. One advantage of using county boundaries is the availability of county, state and federal data for the counties. With the exception of the Coos Bay district in western Douglas County and the Medford District in southern Douglas County, county and BLM district boundaries are reasonably close. The western Oregon counties and BLM districts are shown in Figure 6. Use of other boundaries, such as rivers, highways, watersheds or district boundaries would sacrifice much of the data advantage and would probably not be as familiar to the individuals and firms to be

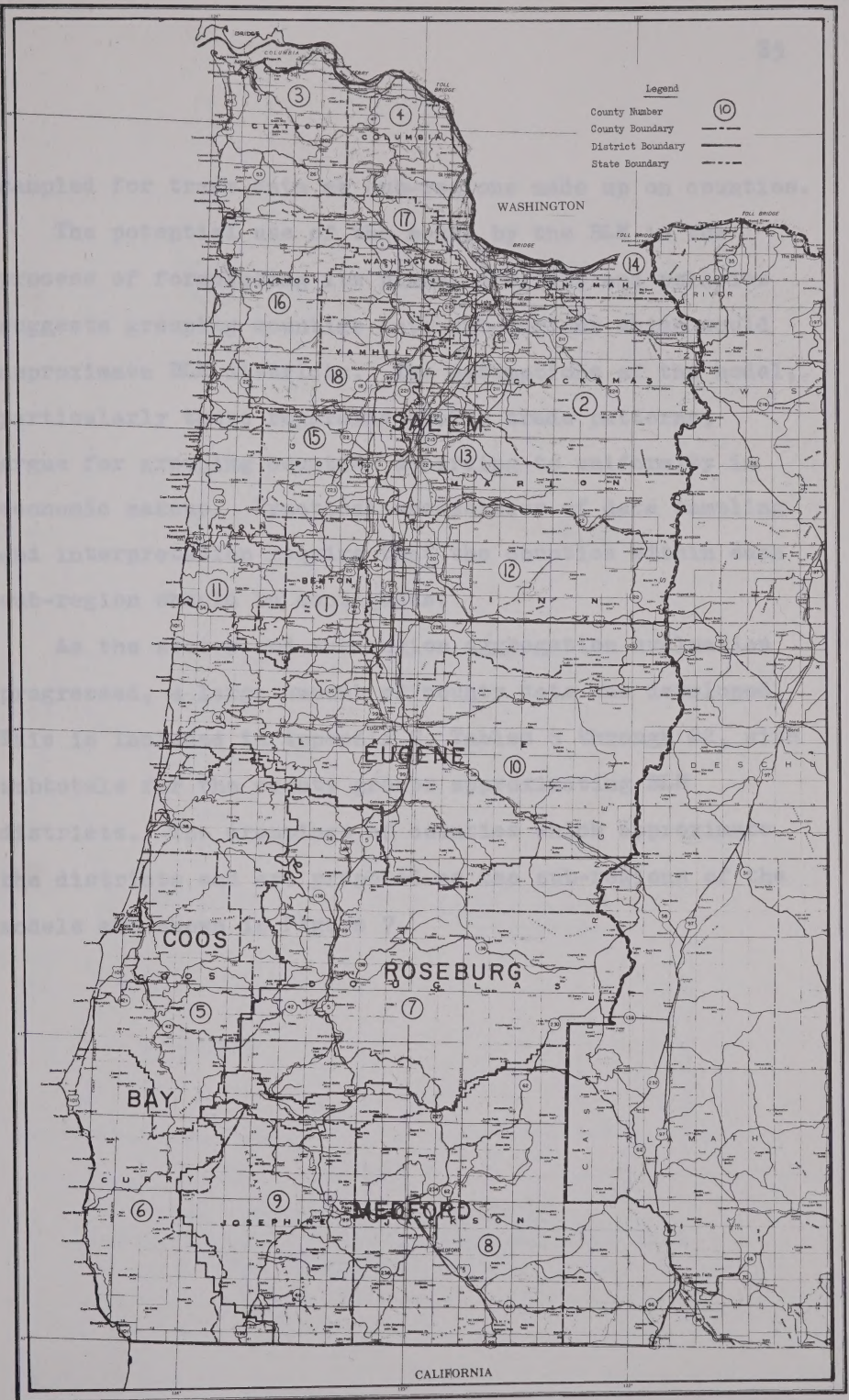


Figure 6
Western Oregon Counties and RLM Districts

sampled for trade data as sub-regions made up on counties.

The potential use of the model by the BLM in the process of formulating its plans, programs and policies suggests grouping counties into sub-regions which would approximate BLM districts. The assumptions of the model, particularly those regarding stable trade patterns, argue for grouping counties according to uniformity in economic makeup. Practical necessities of data sampling and interpretation require that the counties within each sub-region should be contiguous.

As the sector and sub-region aggregation evaluation progressed, a large amount of county data was developed. This is included in Appendix C, Tables 8 through 22, with subtotals for the county groups approximating BLM districts. The groupings of counties which approximate the districts and are proposed as the sub-regions of the models are shown in Figure 7.

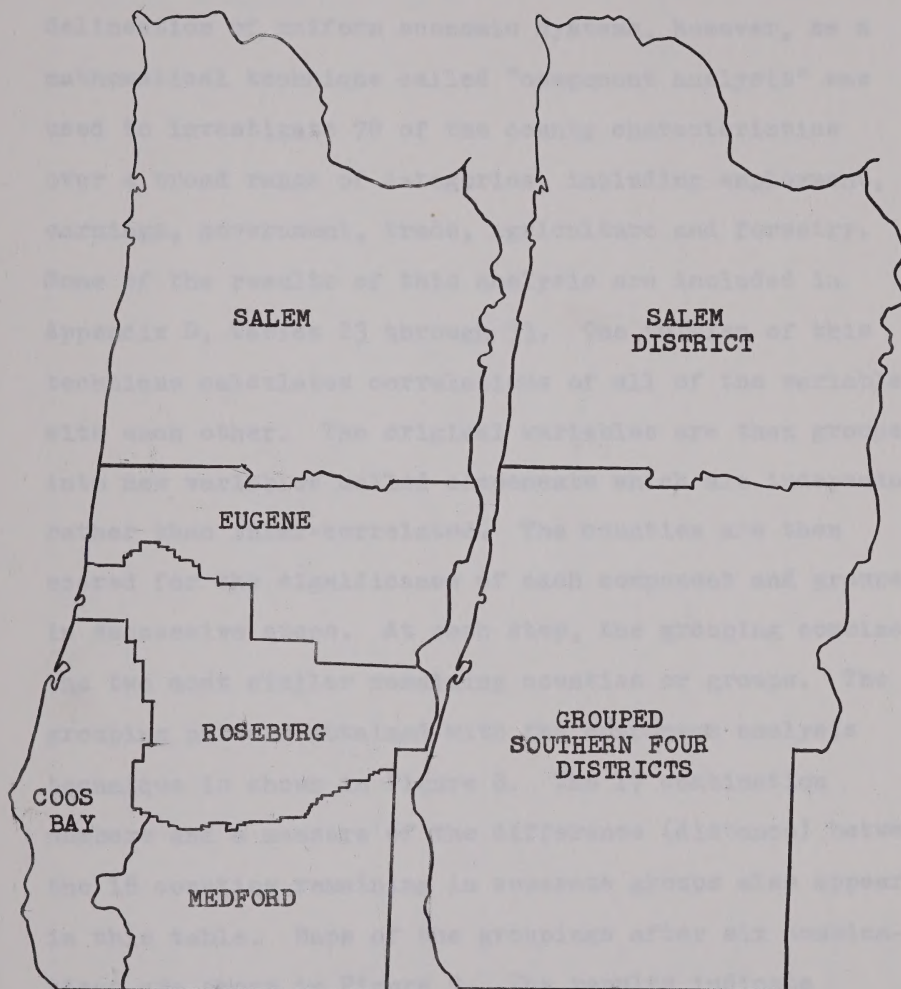


Figure 2

The Sub-region Alternatives:
County Groupings Approximating BLM Districts
and Grouped Districts

Visual examination of this data does not verify the delineation of uniform economic systems, however, so a mathematical technique called "component analysis" was used to investigate 70 of the county characteristics over a broad range of categories, including employment, earnings, government, trade, agriculture and forestry. Some of the results of this analysis are included in Appendix D, Tables 23 through 33. One version of this technique calculates correlations of all of the variables with each other. The original variables are then grouped into new variables called components which are independent rather than inter-correlated. The counties are then scored for the significance of each component and grouped in successive steps. At each step, the grouping combines the two most similar remaining counties or groups. The grouping pattern obtained with the component analysis technique is shown in Figure 8. The 17 combination numbers and a measure of the difference (distance) between the 18 counties remaining in separate groups also appear in this table. Maps of the groupings after six combinations are shown in Figure 9. The results indicate considerable similarity in the four southern BLM districts which are grouped as a relatively uniform region after the seventh combination. Some exceptions to the district groupings are evident: Linn, Polk and Yamhill counties

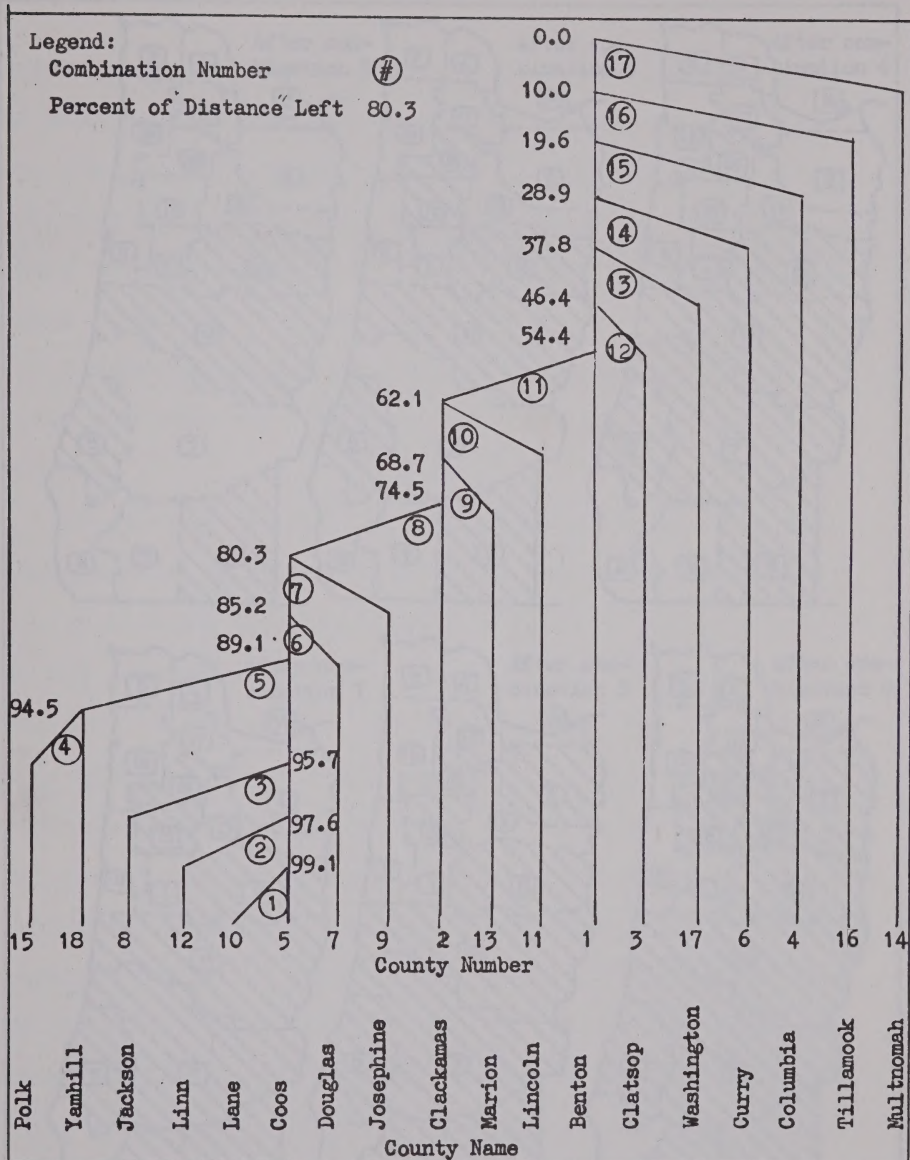


Figure 8
County Grouping Pattern

(17 Combinations of the 18 Counties in Western Oregon, R Mode)

Source: Appendix D, Table 30.

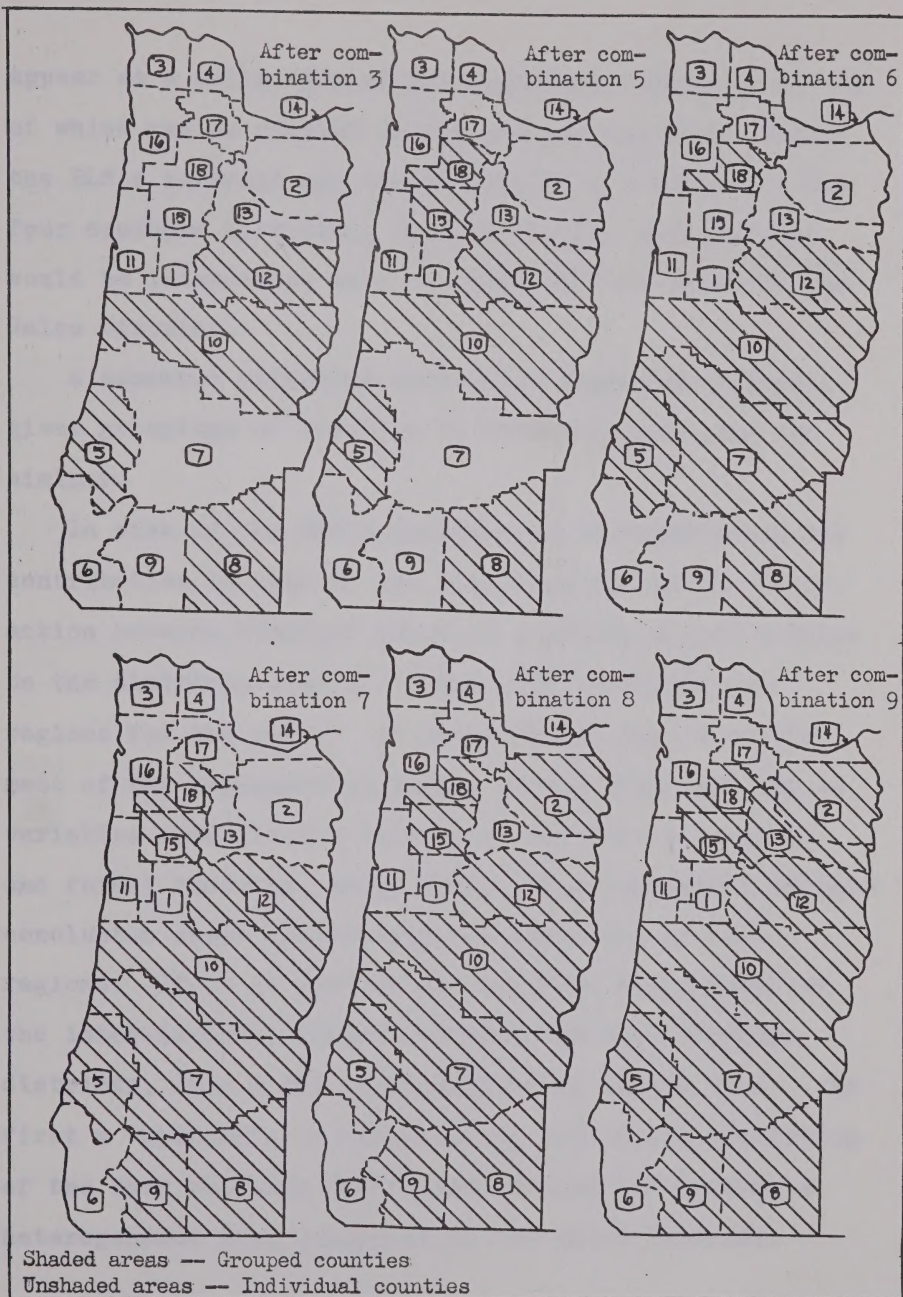


Figure 9
County Grouping Pattern Maps (R Mode)

appear as a collection of heterogeneous counties, no two of which are as similar as the grouped counties. Since the BLM's interest and direct impact is greatest in the four southern districts, this relatively uniform area would be interacting with the less uniform areas in the Salem District.

A somewhat different version of component analysis gives groupings of counties in which the patterns are similar.

In view of the BLM's interest in distinguishing its contribution in each of the districts and in the interaction between district areas, the county groups similar to the districts seem to be the most desirable sub-regions for the model. It seems likely that a refinement of the component analysis, with a different set of variables specifically related to the forest resource and forest industry, would result in a refinement of this conclusion about delineating the districts as sub-regions. If it is elected to sacrifice measurement of the inter-district impacts between the four southern districts, then a two sub-region model may be used: the first a "uniform", or homogeneous, sub-region consisting of the four southern BLM districts; and the second, a heterogeneous one, comprised of the Salem District.

Notes for Chapter IV

- (1) U.S. Bureau of the Budget, Standard Industrial Classification Manual, 1967, Prepared by the Office of Statistical Standards (Washington, D.C.: Government Printing Office, 1967), p.612.
- (2) Ibid., p.613.
- (3) Gerald J. Karaska, Variation of Input-Output Coefficients for Philadelphia Manufacturing (HSRI Discussion Paper Series, no.13; Philadelphia: Regional Science Research Institute, 1967), p.14, 28.
- (4) U.S. Dept. of Commerce. National Economics Division, "The Transactions Table of the 1958 Input-Output Study and Revised Direct and Total Requirements Data," Survey of Current Business, XLV (Sept., 1965), p.33-49.
- (5) Robert Loring Allen and Donald A. Watson, The Structure of the Oregon Economy: An Input/Output Study (Eugene, Ore.: Bureau of Business and Economic Research, University of Oregon, 1965), p.35.
- (6) Oregon State Dept. of Employment. Research and Statistics Division, Oregon Covered Employment and Payrolls by Industry and County, Third Quarter, 1967 (Salem, Ore.: 1967), p.4-94.
- (7) Robert Loring Allen and Donald A. Watson, "The Oregon Input/Output Study," Oregon Business Review, XXIV (December, 1965), p.2.
- (8) Hays B. Gamble and David L. Raphael, A Micro-regional Analysis of Clinton County Pennsylvania (2 vols.; University Park, Pa.: Pennsylvania Regional Analysis Group, Pennsylvania State Univeristy, 1966), v.2, p.56-57.

CHAPTER V

DATA COLLECTION AND ANALYSIS:

METHODS AND COSTS

It is now possible to outline the implementation of the alternative input-output models for western Oregon, using the sectors and sub-regions identified in Chapter IV. The transactions to be measured and the sampling approach must be considered before cost estimates for the four alternatives can be made. It is assumed that the input-output study will be made by a contractor, probably an Oregon research or education institution. The study proposed here does not include impact analyses of alternatives by the contractor; these would be generated by BLM and other users. Studies in many fields other than land management, such as industrial and water resource development, may be aided by the use of the input-output model described. Thus other potential users might be found to share in the cost of the study.

A. Transactions Included and Their Valuation

Inputs and outputs may be measured in three different ways: (1) by the amount of a sector's output used by another sector -- for example, tons of paper used in food processing; (2) by the amount of a primary resource used, such as man-years utilized by the paper sector to produce

output used by the food processing sector; or (3) by monetary value. Monetary value will be used since it is a unit applicable to all sectors.

The transactions included are those directly related to production of goods and services in the base year of measurement. Consequently, "purely financial" transactions, such as loans, advances, and transfers of assets produced in a previous period, are excluded.⁽¹⁾ However, payment for a service provided during the period, such as the cost of a loan or a broker's fee for transfer of securities, is included.

Expenditures for capital goods (investment) is usually not considered as production inputs in the base period.⁽²⁾ Capital goods may be considered as any having an expected life of more than one year. Expenditures for capital goods are relegated to an investment and two construction columns to maintain the relationship between current inputs and outputs. Current use of capital goods (depreciation) is shown in a row, Sector 44.

The sales of a sector are not necessarily equal to the value of its output or input, since changes in inventory may occur. Input may be defined as the sum of (1) the value of goods and services purchased, (2) any decrease in inventory, (3) use of capital (depreciation), and (4) retained earnings. Stocks of material purchased

during the period but not used are not included as current input; such inventory investment is included in Sector 44. Output may be defined as the sum of (1) the value of the goods or services sold for current uses, (2) inventory investment, and (3) sales of capital goods.

Some intra-firm accounting transactions may be included. This is appropriate in recording capital depreciation and may also be appropriate for inter-sector trade within a company. Recording transactions by establishment rather than by firm is suggested to reduce the problem of vertical integration, such as a company producing timber, lumber, plywood, pulp, and paper, which in our model crosses several sectors.

Goods and services may be valued at either producer (f.o.b.) or purchaser (delivered) prices. Since purchaser prices include the costs of marketing and transportation, it is evident that some double accounting occurs when they are employed. One advantage of the purchaser price system appears to lie in the ease with which the data on control totals can be located because this system is used in census publications, whereas producer prices must be derived. This advantage, however, does not seem to offset the effects of double counting.⁽⁴⁾ Consequently, the use of producer prices is assumed.

An important guideline in the construction and use of

the transactions table is stated by Chenery and Clark: ⁽⁵⁾

"The nature of the input-output model requires that transfers of goods from one sector to another should be portrayed as a direct transfer in the appropriate cell of the table, without regard to the variety of trading and transportation channels which may actually have been used. This means that the trade and transportation sectors must be treated as producing simply the value of their services as measured by their gross margins."

The value of imports is the "port of entry" value, which is equivalent to a producer price at the plant. Marketing costs for imports are treated in the same way as those for items produced within the region. This approach to import valuation applies to either import form of the model (Figure 3c with imports in quadrant III, or Figure 3d with imports in quadrant II). Imports in the inter-regional model are the difference between total purchases from a sector and the sum of sub-regional purchases. An import array using the same sectors as quadrant II may be developed with little added effort, essentially in questionnaire design and keypunching of the data. Figure 10 shows the data requirement for imports by sector as a single column of purchases. The advantage of this approach is that it allows the investigator to separate total activity into regional (or sub-regional) and import activity. This facilitates revision of regional coefficients in any later use if the research such as impact analysis or study of regional production as a sub-

stitute for imports.

Export transactions are recorded at the price received by the producer as for regionally produced and used goods and services. Marketing costs paid to regional sectors may include transportation charges to a destination outside of the region; the part of the transportation service charge not earned in the region should appear as an import of transportation sector.

B. Sampling

Data on transactions which cannot be derived from secondary sources are obtained directly from firms and households in the region. As a result of the large number of firms and households, primary data are obtained from a sample and then expanded to the total population with the aid of secondary sources for row and column totals.

Sampling of firms, or establishments, where a firm operates at more than one location, is on a sector and sub-region basis. Lists of establishments in a sector-sub-region group may be compiled directly from industry directories, trade and professional organizations, phone books, etc. Each establishment is classified by SIC code and assigned to a sector. A less time-consuming and expensive alternative is to develop the lists with the cooperation of the State of Oregon, from data which are already collected on an SIC, address, and employment size-

Data Period: January 196_ to December 31, 196_

Sales (Rows of Output)					
Producing Sector Sales to		Total Receipts From	% of Sales by Purchasing Sector and its Location		
			Subregion		
			1	2	
Sales by Sector and Subregion	Sectors	a=1			
					
	i				
					
	h=44				
Total Intermediate Sales Output					
Export Sales to Quadrant I	Sectors	k=45			
					
	o				
					
	p=50				
Total Export					
Total Receipts					

Purchases (Columns of Inputs)					
From Producing Sectors	Total Expend. Paid to	% by Seller Location and Sector		Imports from Rest of World *	
		Subregion			
		1	2		
Purchases from Sectors by Subregion and Imports from Rest of World	a=1 . . . i . . . h=44				
Total Intermediate Purchases Use					
Purchases of Primary Inputs from Rest of World	k=45 . . . m . . . *n=49				
Total Primary					
Total 'Expenditure					

Figure 10
Questionnaire Design Guide

* The input purchase column, Imports from Rest of the World, by individual sectors is an alternative to the quadrant III sectors of Produced Imports and Non-resident Factor Earnings (Sectors 48 and 49) in Figure 5, page 64, which are groups of many sectors.

class basis. Cooperation by the State of Oregon and the availability of these data are assumed in the cost estimates which follow.

Discussion with Drs. Bourque, Gamble, and Stoevener, all of whom have considerable experience with input-output studies, indicate that no sound statistical guidelines exist for predetermining the sampling rate for each sector-sub-region population.⁽⁶⁾

Dr. Gamble has suggested a sampling rate for establishments by employment size class for all sectors and sub-regions combined. Population estimates by employment size class for the individual sectors and sub-regions are not available.⁽⁷⁾ Table 8 summarizes the available establishment population data by sub-region and employment size class, the suggested sampling method, and Dr. Gamble's sampling rate. Where a population is not 100-percent sampled, a random selection is assumed. The 100-percent sample rate for the largest firms, over 100 employees, is, in effect, a preselection of these firms because they generally represent a high proportion of the trade flows.

The establishment sampling cost estimate (Table 12) is made for the alternative forms of the model by adjusting Dr. Gamble's basic rate.⁽⁸⁾ The basic rate may be interpreted as the percent of the establishment population to be sampled in a single region model of about 30 sectors,

Table 8a
Estimated Number of Establishments by Sub-region, W. Oregon, 1967

Subregion	1	2
	Number of Establishments	
	Estimate 1	Estimate 2
Salem	26,424	24,401
Eugene	3,926	3,716
Roseburg	1,470	1,283
Medford	2,742	2,492
Coos Bay	1,560	1,411
Estimated Total	36,122	33,303

Table 8b
Number of Establishments by Employment Size Class, W. Oregon, 1967

Size Class	3	4	5	6	
	Covered Establishments Reporting	Estimated Additional Establishments	Estimated Total	Sampling Method	"Basic" Rate
100+	634	500	1,134	Interview	100%
50-99	790	300	1,090	Interview	50%
20-49	2,311	200	2,511	Mail	40%
8-19	5,371	500	5,871	Mail	20%
1- 7	24,197	1,319	25,516	Mail	10%
Estimated Total	33,303	2,819	36,122		

Data Sources by Column Number:

- 1 Appendix C, Table 21, Column C; Oregon covered employment reporting units.
- 2 Appendix C, Table 9, Column 52: Establishments covered by County Business Patterns.
- 3 Appendix C, Table 9, Columns 53-57.
- 4 Arbitrary allocations calculated by author based on differences between totals in columns 1 and 2.
- 5 Calculations by author based on columns 3 and 4.
- 6 Sampling method and rate suggested by Dr. Hays B. Gamble during an interview, January 2, 1969.

which would give an average sector-region population of about 1200. As the number of sub-regions or sectors increases and the population size decreases, a higher sampling rate is required to maintain the level of reliability implied in Dr. Gamble's suggestion. The sampling rates are modified for the alternative models by employment-size class, using the basic rate and the population data of Table 9. The sampling rates are shown, modified, and used in Table 12 to estimate the sampling cost for the alternative models. The number of sector-subregion populations is the product of sectors having establishments assigned to them and the number of sub-regions; this is shown in Table 9 with the implied average population. It is apparent from Appendix C, Table 20, that many of the sector-sub-region populations in the four southern districts are much less than the averages shown in Table 9, thus implying the desirability of a higher sampling rates in the smaller sectors of the southern sub-regions and a lower rate in the larger sectors in the Salem sub-region.

Table 2

Number of Sector-Sub-region Populations and Their
Average Population Size by Alternative

<u>Number of Populations*</u>			<u>Average Population Size</u>		
Number of Subregions	Number of Sectors		Number of Subregions	Number of Sectors	
	33	50		33	50
2	60	90	2	600	400
5	150	225	5	240	160

*Number of sectors with establishments assigned to them multiplied by the number of sub-regions. Some sectors, such as foreign exports, include only transactions, not establishments.

Data are collected through the use of a questionnaire as developed from the guide in Figure 10. In order to facilitate its completion and improve accuracy, the questionnaire should be adapted to each sector. It should also be pretested to insure its clarity and completeness.

The data collection plan for business establishments includes an interview-questionnaire combination and a mail questionnaire. The interviewing should be done by an experienced interviewing organization for those establishments with more than 50 employees. Sub-contracting for the interviewing of business establishments and households permits us to assume, that with increased staff and

effort by the interviewing contractor, the sampling time required for all study alternatives will be the same. (A fixed time would be impractical for an inexperienced group of interviewers hired for a short period by the contractor). This approach is adopted after discussions with Drs. Gamble and Stoevener. They also indicate that the interview will cost approximately \$15.00 per establishment. This cost estimate is based on the assumption that the interviewers would visit the sample establishments to explain the study and data needs and leave the questionnaire for completion and return by mail. Thus the interviewer would not make an in-depth investigation of records to complete the form at the time of the interview. Considering travel and interviewing time, an average rate of five establishments per interviewer per day is anticipated.

A population list of households is unnecessary. Drs. Gamble and Stoevener suggest that a sample of 1000 households* is a reasonable upper limit. Gamble and Raphael⁽⁹⁾ describe one technique for sampling urban households and another for rural households. A random

*This is approximately 0.18 percent of the 559,400 households estimated in Appendix C, Table 11, Column 1.

selection from a phone book is used to obtain a base address for the urban sample, which is then offset a prescribed distance and direction from the base address. The rural sample is selected by choosing areas at random from a grid of the region and sampling the households in these areas.

Data collection for transactions by government sectors resembles that for business firms except for the design of the questionnaire. Smaller government units will also be sampled by mail. The 1962 Census of Governments reports 1008 local governments in the region. (10)

Data collection practices must be planned to prevent disclosure of data for an individual establishment. From Appendix C, Table 20, it can be seen that only six of the 210 sector-sub-region populations are estimated to have as few as three to five establishments. Care will have to be used as the actual populations are developed, to avoid revealing confidential data.

C. Completion of the Model

Tabulation, summation, and expansion of the sample data to the control totals derived from secondary data follow primary data collection. The transactions data are then adjusted to obtain equal row and column totals for each sector in each sub-region.

In the process of making the adjustments, it may be

necessary to revisit some of the sample firms to reconcile inconsistencies which may appear.

It is presumed that computers will be used in tabulating the raw data and in computation of the input coefficient and inter-dependency matrices.

A report by the contractor's staff detailing the procedures used, problems encountered, and an analysis of the variation in the data and the matrices of the model will conclude his work.

D. Cost Estimates for the Input-Output Model Alternatives

The costs shown below follow an approach developed with Dr. Gamble and are based upon his experience in the completion of several studies using a similar approach.

The annual cost of a basic staff and operations is estimated in Table 10. This is followed by Tables 11a and 11b, which estimate the completion time and staff cost for each of the alternatives. The establishment sampling costs described on page 100 are shown in Table 12. The cost of \$1.25 per establishment for mail questionnaires covers mailing and a review of the completed forms.

Using a sample of 1000 households, a cost of \$10.00 each for all four alternatives gives a household sampling cost of \$10,000. (Household interviews differ from business interviews in that the interviewer completes the questionnaire with the individual being interviewed.

This is considered necessary for accurate completion of the form and accounts for the comparatively high cost.)

An estimated cost for each of the four alternatives is given in Table 13, which combines Tables 11b and 12. The cost estimates developed in Tables 10 through 13 do not include contingency costs. A 15 percent contingency cost for staff and sampling is added to cover uncertainties, such as adjustments of the transactions and sampling callbacks, the total cost estimate shown in Table 14.

Table 10

Annual Cost of Staff and Operations

Personnel	Man Years per Year	Annual Cost
Project Director (Experienced input-output researcher)	1/3	\$ 6,000.
Staff Leader (Experienced researcher)	1	\$10,000.
Assistants (Such as graduate students)	1	\$ 7,000.
Secretary	1/2	\$ 3,000.
Clerical Help	3/5	\$ 2,000.
Interviewers (See Interviewing cost, Table 12)		
Supplies		\$ 1,000.
Computer		\$ 3,000.
	Subtotal	\$32,000.
Overhead (Office space & equipment, estimated at 60% of subtotal above)		\$19,200.
	Total	<u>\$51,200.</u>

Table 11a
Estimated Months Required to Complete the Four Study Alternatives
 (With Assumed Staff of Table 10)

Stage	Months
Developing Population Lists (All Alternatives)	6
Data Collection (All Alternatives)	4
Key Punching and Checking Data	1
Inferring Population from Sample	

	Months to Complete	
Number of Subregions	Number of Sectors	
	33	50
2	3	5
5	5	9

Transactions Matrix Construction

	Months to Complete	
Number of Subregions	Number of Sectors	
	33	50
2	1	2
5	4	11

Report Writing (All Alternatives) 3

Total Months by Staff to Complete the Study

	Months to Complete	
Number of Subregions	Number of Sectors	
	33	50
2	18	21
5	23	34

Table 11b
Estimated Total Staff and Operating Costs* by Alternative

Number of Subregions	Number of Sectors	
	33	50
2	\$ 77,000	\$ 90,000
5	\$ 98,000	\$ 145,000

*\$ 51,200. per year as in Table 10.

Table 12
Establishment Sampling Costs by Firm Size and the Four Alternatives

Estimated No. of Establishments in Region	Basic Population Sampling Rate (Percent)	Modified Sampling Rate in Four Alternatives (Percent)	Number of Establishments in Modified Sample by Alternative	Cost per Estab- lishment All Alt- ernatives	Estimated Establishment Sampling Cost by Alternative
Employment Size Class 100+					
		Sectors 33 50	Sectors 33 50		Sectors 33 50
1,134	100	2 Regions 100.0 100.0 5 Regions 100.0 100.0	1,134 1,134 1,134 1,134	\$15.00	\$ 17,010 17,010 \$ 17,010 17,010
Employment Size Class 50-99					
1,090	50	2 Regions 55.0 70.0 5 Regions 80.0 95.0	605 765 875 1,035	15.00	\$ 9,050 11,500 \$ 13,100 15,500
Employment Size Class 20-49					
2,511	40	2 Regions 50.0 70.0 5 Regions 75.0 90.0	1,255 1,760 1,880 2,280	1.25	\$ 1,565 2,200 \$ 2,350 2,850
Employment Size Class 8-19					
5,871	20	2 Regions 30.0 40.0 5 Regions 50.0 65.0	1,760 2,350 2,940 3,820	1.25	\$ 2,200 2,940 \$ 3,680 4,770
Employment Size Class 1-7					
25,516	10	2 Regions 20.0 30.0 5 Regions 35.0 45.0	5,100 7,650 8,920 11,500	1.25	\$ 6,370 9,550 \$ 11,150 14,400
Estimated Total Establishment Population *					
36,122	17.5	2 Regions 27.2 35.1 5 Regions 43.7 54.8	9,854 12,659 15,749 19,769		\$ 36,195 43,200 \$ 47,290 54,530

* "Basic" sample: weighted average sampling rate 17.5, sample size 6,309, cost \$31,075.

Table 13Estimated Cost by Alternative
(Thousands of Dollars)

Number of Subregions	Cost Item	Number of Sectors	
		33	50
2	Staff, Office, Overhead*	\$ 77	\$ 90
	Establishment Sampling**	36	43
	Household Sampling***	10	10
	Total	\$123	\$143
5	Staff, Office, Overhead*	\$ 98	\$145
	Establishment Sampling**	47	54
	Household Sampling***	10	10
	Total	\$155	\$209

*Source: Table 11b

**Source: Table 12

***Source: Page 104

Table 14Estimated Total Cost by Study Alternative*
(Thousands of Dollars)

Number of Subregions	Number of Sectors	
	33	50
2	\$141	\$164
5	\$178	\$240

*Total in Table 13 is adjusted to include a 15 percent contingency factor.

Notes for Chapter V

(1) United Nations. Statistical Office, Dept. of Economic and Social Affairs, Problems of Input-Output Tables and Analysis (Studies in Methods: Series F, no.4; New York, United Nations, 1966), p.36.

(2) Ibid., p.37.

(3) W. Duane Evans and Marvin Hoffenberg, "The Inter-industry Relations Study for 1947," The Review of Economics and Statistics, XXXIV (May, 1952), p.97-131.

(4) United Nations, op. cit., p.38.

(5) Hollis B. Chenery and Paul G. Clark, Interindustry Economics (New York: John Wiley & Sons, 1967), p.141.

(6) Interview with Dr. John Bourque, University of Washington, Seattle, Washington, July 15, 1968.

Interview with Dr. Hays B. Gamble, Pennsylvania State University, University Park, Pa., January 2, 1969.

Interview with Dr. Herbert H. Stoevener, Oregon State University, Corvallis, Ore., June 15, 1968.

(7) Establishment populations have been estimated on three bases: Area and employee size class as in Appendix C, Table 8; Area and sector, as in Appendix C, Table 19; and Sector and employee size class as in Appendix C, Table 20.

(8) Interview with Dr. Hays B. Gamble ... January 2, 1969.

(9) Hays B. Gamble and David L. Raphael, A Microregional Analysis of Clinton County, Pennsylvania (2 vols.; University Park, Pa.: Pennsylvania Regional Analysis Group, Pennsylvania State University, 1966), v.2, p.34-35.

(10) U.S. Bureau of the Census, Census of Governments, 1962 (Vol.4, Compendium of Government Finances: Government in Oregon; Washington, D.C.: Government Printing Office, 1963), p.44-45.

CHAPTER VI

SUMMARY

The purpose of this report is to draw up a set of alternative plans for a study of the western Oregon economy (Chapter I). The aims of such a study would be (1) to assess the current position of the Bureau of Land Management in the regional economy, and (2) to provide a means for evaluating management decision alternatives in terms which are consistent with the Bureau's goal to contribute to the economic stability of the communities which it serves.

Among several methods (Chapter II) for studying a regional economy, the one chosen here as most adaptable to BLM's purposes is the input-output method. The method describes economic activity as flows of money of commodities among groups of agencies, firms, and households ("sectors"), between sectors in one sub-region and those in another, and between those in the region and the outside world (Chapter III).

The input-output method makes it possible to fulfill both of the aims stated above: (1) to measure the role of any one sector -- within a sub-region, if desired, (e.g., BLM timber operations in the Eugene District) -- in the sub-regional or regional economy at large; (2) to trace the impact of changes in a sector (e.g., introduction

of a major thinning program) upon other sectors and sub-regions and the outside world. Role and impact are measured in terms of the money or commodity flows mentioned earlier.

The input-output method has been widely used in the United States for the purposes here intended. It is a flexible method, which makes full use of modern computer techniques, and which produces simple and understandable results.

For application in western Oregon, four alternative forms of input-output analysis hold special promise (Chapters IV, V). The four differ mainly in the number of separate sectors and sub-regions recognized -- that is to say, in the degree of detail in which the economy is broken apart for study. The estimated total costs of the alternatives range from \$141,000 to \$240,000. Since the results of the research will, with little or no modification, be widely useful to other agencies, the Bureau may well find it possible to enlist their cooperation and their help in the sharing of the costs.

For all four input-output alternatives, the study procedures are essentially the same and are best followed by an experienced consultant under contract to BLM. Data are gathered from published sources and, by interview, from a sample of agencies, firms, and households. These

data are put into standard tables which summarize the economic flows. The tables are then manipulated by a computer into a form which the Bureau can use to study its role and its impacts -- to derive broad guides to its programs and policies.

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Appendix A: Table 1
Forest and Wood Resources: Commercial Forest Lands

State	Area (Acres)	Standing Volume (Cu. ft. M.B.F.)	Annual Production Potential*** (Cu. ft. M.B.F.)
Alaska	1,000,000	100,000,000	1,000,000
Arizona	1,000	10,000	100
California	20,000,000	2,000,000,000	200,000,000
Colorado	10,000,000	1,000,000,000	100,000,000
Idaho	20,000,000	2,000,000,000	200,000,000
Montana	10,000,000	1,000,000,000	100,000,000
Nebraska	10,000	100,000	1,000
New Mexico	10,000	100,000	1,000
Oregon, Eastern	10,000,000	1,000,000,000	100,000,000
Oregon, Western****	1,000,000	100,000,000	1,000,000
South Dakota	10,000	100,000	1,000
Texas	10,000	100,000	1,000
Washington	10,000,000	1,000,000,000	100,000,000
Wyoming	10,000,000	1,000,000,000	100,000,000
Other States****	1,000,000	100,000,000	1,000,000
Total	40,000,000	4,000,000,000	400,000,000
Percent of total U.S. and poss. forest land	1.0	1.0	1.0
% of total U.S. forest	1.0	1.0	1.0
Other U.S.	1.0	1.0	1.0

APPENDIX A
SELECTED
BUREAU OF LAND MANAGEMENT
AND FOREST RESOURCE
DATA BY STATE

Tables 1 through 5

* Commercial forest lands are those lands owned by the Federal Government, State Governments, or Private Landowners which are managed for commercial production of forest products.

** Standing volume not defined in source.

*** Annual production potential defined as "the volume of wood fiber which could be produced in a given year on a sustained yield basis under the best management practices and under a sustained yield system (see source, p. 100)."

**** States which include the potential U.S. forest lands, the commercial forest lands, and the potential U.S. forest lands owned by the U.S. Department of Agriculture under administrative jurisdiction of the BLM. Federal lands include the public lands and of BLM & U.S. Department of Agriculture.

***** Other states include Alaska, Arizona, California, Colorado, Idaho, Montana, Nebraska, New Mexico, North Dakota, South Dakota, Texas, Utah, and Wyoming.

***** Percentages calculated by author.

Appendix A: Table 1
Bureau of Land Management Commercial* Forest Lands

State	1 Acres	2 Standing Volume** (M. Bd. Ft.)	3 Annual Producing Capacity*** (M. Bd. Ft.)
Alaska	35,000,000	167,000,000	1,400,000
Arizona	3,900	12,000	100
California	239,042	2,672,491	47,000
Colorado	407,665	871,651	17,269
Idaho	271,601	2,192,707	29,425
Montana	572,005	1,481,000	23,244
Nevada	40,860	---	---
New Mexico	64,937	67,840	1,948
Oregon, Eastern	168,417	734,080	23,900
Oregon, Western****	2,140,779	52,323,489	1,237,243
South Dakota	5,820	22,000	---
Utah	80,950	108,123	1,058
Washington	52,569	234,434	5,500
Wyoming	256,827	1,108,000	15,100
Other States*****	38,742	66,106	1,568
Total	39,344,114	228,893,921	2,803,355
Percent of Total BLM, Excluding Alaska*****			
W. Oregon	49.29	84.54	88.16
E. Oregon	3.88	1.19	1.70
Other BLM	47.83	14.27	10.14

* Commercial forest land: Lands growing stands of forest trees which possess present or potential merchantable value.

** Standing volume not defined in source.

*** Annual producing capacity defined as "the amount of wood fiber which forest land is capable of growing" and here assumed to approximate total available timber cut under a sustained yield system. (see Source, p. 131)

**** Western Oregon includes the revested O & C lands, the reconveyed Coos Bay Wagon Road lands and public lands west of Range 8 E, Willamette Meridian under administrative jurisdiction of the BLM. Eastern Oregon includes the public lands east of Range 8 E, Willamette Meridian.

***** Other states include: Alabama, Arkansas, Florida, Louisiana, Michigan, Minnesota, Mississippi and Wisconsin.

***** Percentages calculated by author.

Appendix A: Table 1 Continued
Bureau of Land Management Commercial Forest Lands

State	4	5	6
	Total Timber Disposition* Volume (M. Bd. Ft.)	Value of Timber Product Disposition (\$)	Volume of Timber Disposition as % of Producing Capacity Volume
Alaska	8,451	26,222	0.01
Arizona	107	704	107.00
California	37,929	872,162	80.70
Colorado	8,538	45,504	46.73
Idaho	26,557	282,690	90.25
Montana	20,135	206,631	86.62
Nevada	510	3,897	-----
New Mexico	1,901	10,464	97.58
Oregon, Eastern	14,808	215,212	61.96
Oregon, Western**	1,255,760	42,058,811	99.07
South Dakota	452	1,832	-----
Utah	899	7,700	84.97
Washington	956	13,375	17.37
Wyoming	3,439	15,028	22.77
Other States***	-----	-----	-----
Total	1,350,442	43,760,232	48.17
Percent of Total BLM, excluding Alaska****			
W. Oregon	71.34	96.17	99.07
E. Oregon	1.10	0.49	61.96
Other BLM	7.56	3.34	35.50

* Total timber disposition includes "all forest product disposition actions taken by the Bureau of Land Management during the fiscal year 1965 by competitive and negotiated sale, free use, rights-of-way sales and additional sales. Products listed as sold, however, were not necessarily all removed from BLM lands or paid for during the fiscal year. (Source, p.133)

** Western Oregon includes the revested O & C lands, the reconveyed Coos Bay Wagon Road lands and public lands west of Range 8 E, Willamette Meridian under administrative jurisdiction of the BLM. Eastern Oregon includes the public lands east of Range 8 E, Willamette Meridian.

*** Other states include: Alabama, Arkansas, Florida, Louisiana, Michigan, Minnesota, Mississippi and Wisconsin.

**** Percentages calculated by author.

Sources for BLM Commercial Forest Land Data

Column
Number

- 1-3 U.S. Bureau of Land Management, Public Land Statistics, 1965
(Washington, D.C.: Government Printing Office, 1966),
p.131.

Column 2, Western Oregon data on timber volume given
in Source as "Total Merchantable Volume" and defined as
including "all timber greater than 11 inches DBH." (p.132).

- 4-5 Ibid., p.133.

- 6 Calculations by author based on columns 3 and 4.

Appendix A: Table 2
Bureau of Land Management Receipts by Source, 1965 (\$)

	1	2	3	4	5
	Mineral Leases and Permits	Sales of Timber	Grazing Leases, Licenses and Permits	All other Receipts	Total
Oregon	27,780	43,675,245*	329,999	418,314	44,451,338
Other BLM Lands	176,714,391	1,199,201	3,920,637	8,075,317	189,909,546
Total BLM	176,742,171	44,874,446	4,250,636	8,493,631	234,360,884
Percent of Total Receipts by Area:**					
Oregon	0.06	98.25	0.74	0.94	100.00
Other BLM Lands	93.06	0.63	2.06	4.25	100.00
Total BLM	75.42	19.15	1.81	3.62	100.00
Oregon Percent of Receipts by Type:**					
Oregon	0.02	97.33	7.76	4.93	18.97
Other BLM Lands	99.98	2.67	92.24	95.07	81.03
Total BLM	100.00	100.00	100.00	100.00	100.00

* Includes \$40,075,719. for timber from O & C lands and \$2,350,025 from Coos Bay lands. Sales and receipts not equal as sales may not all be paid for or removed in the year of sale.

** Percentages calculated by author.

Source

Column
Number

1-5 U.S. Bureau of Land Management, Public Land Statistics, 1965 (Washington, D.C.: Government Printing Office, 1966), p. 176-177.

Appendix A: Table 3
Land and Commercial Forest Areas for States in which the Bureau of Land
Management has Holdings, 1965 (1,000 Acres)

	1.	2	3	4	5	6	7
	Total Land Area	Commercial Forests					
		All Ownerships	National Forests	BLM	Other Public	Forest Industry	Other Private
Alaska	365,481	5,761	5,304	252	175	---	30
Arizona	72,688	3,870	2,551	5	1,179	69	66
California	100,207	17,391	8,656	326	365	2,945	5,099
Colorado	66,486	12,275	8,384	415	343	14	3,119
Idaho	52,933	15,823	11,310	404	1,043	1,204	1,826
Montana	93,271	17,300	10,578	612	1,250	1,047	3,813
Nevada	70,264	109	30	2	0	0	77
New Mexico	77,766	6,078	3,441	80	758	129	1,670
Oregon	61,599	26,613	12,545	2,477	1,280	5,009	5,302
South Dakota	48,882	1,706	957	10	256	17	466
Utah	52,697	4,004	2,783	155	398	---	668
Washington	42,694	19,510	6,160	187	4,012	4,401	4,750
Wyoming	62,343	4,853	3,364	395	235	55	804
Other States*	371,338	153,530	11,868	106	18,227	23,678	99,651
Total	1,538,649	288,823	87,931	5,426	29,521	38,568	127,377

* Other states include: Alabama, Arkansas, Florida, Louisiana, Michigan, Minnesota, Mississippi, North Dakota, Oklahoma and Wisconsin.

Sources

Column
Number

- 1 U.S. Forest Service, Timber Trends in the United States (Forest Resource Report, no. 17; Washington, D.C.: Government Printing Office, 1965), p. 140.
- 2-7 Ibid., p. 141-142.

Appendix A: Table 4Land Area, Public Forest, Commercial Forest and Bureau of Land Management Percentages in Areas, 1965

	1	2	3	4	5	6
	Commercial Forest % of All Land	Public Commercial as % of Commercial Forest	Total BLM (1000 Acres)	BLM as % Total Land Area	BLM Commercial Forest as % of Commercial Forest	% of BLM Commercial Forest
Alaska	1.58	99.48	311,541	85.24	0.00	4.37
Arizona	5.32	96.51	13,034	17.93	0.04	0.13
California	17.35	53.75	15,617	15.58	2.07	1.87
Colorado	18.46	74.48	8,312	12.50	4.99	3.38
Idaho	29.89	80.62	12,311	23.26	3.28	2.55
Montana	18.55	71.90	8,268	8.86	7.40	3.54
Nevada	0.16	29.36	47,195	67.17	0.00	1.84
New Mexico	7.82	70.40	13,826	17.78	0.58	1.32
Oregon	43.20	61.26	15,617	25.35	15.86	9.31
South Dakota	3.49	71.69	280	57.38	3.57	0.59
Utah	7.60	83.32	23,473	44.54	0.66	3.37
Washington	45.70	53.10	259	60.70	72.15	0.97
Wyoming	7.78	82.30	17,443	27.98	2.26	8.13
Other States with BLM Commercial Forests*	41.35	19.73	168,036	45.25	0.06	0.07
Total	18.77	42.54	655,220	42.52	0.83	1.78

* Other states include: Alabama, Arkansas, Florida, Louisiana, Michigan, Minnesota, Mississippi, North Dakota, Oklahoma and Wisconsin.

SourcesColumn
Number

- 1 Calculations by author based on columns 1 and 2, Table 3.
- 2 Calculations by author based on columns 2 through 5, Table 3.
- 3 U.S. Bureau of Land Management, Public Land Statistics, 1965 (Washington, D.C.: Government Printing Office, 1966), p. 17.
- 4 Calculations by author based on column 3, this table, and column 1, Table 3.
- 5 Calculations by author based on columns 2 and 4, Table 3.
- 6 Calculations by author based on column 4, Table 3 and column Table 4.

Appendix A: Table 5

Net Volume of Sawtimber of All Species on Commercial Forest Lands for States where the Bureau of Land Management had Timber Disposition or Holdings in 1965.
(Million Board Feet, International $\frac{1}{4}$ Inch Log Rule)

	1	2	3	4	5	6
	All Ownerships	National Forest	BLM	Other Public	Forest Industry	Farmer and Misc. Private
Alaska	182,555	170,928	180,000	-169,339*	---	966
Arizona	28,287	19,954	13	7,466	437	417
California	303,912	162,103	6,621	5,010	48,664	81,514
Colorado	64,258	52,793	2,097	514	62	8,792
Idaho	126,801	94,985	2,349	8,725	8,144	12,598
Montana	112,637	75,479	1,159	8,295	9,624	18,080
Nevada	572	87	2	0	449	34
New Mexico	31,742	16,415	219	6,367	626	8,115
Oregon	536,309	298,859	55,587	41,174	96,874	43,875
South Dakota	4,187	2,687	6	493	35	530
Utah	22,341	18,260	1,900	221	---	1,960
Washington	373,065	166,040	687	5,066	101,923	39,349
Wyoming	28,324	23,871	1,125	725	178	2,425
Other States**	249,066	24,226	69	18,611	66,726	139,434
Total	2,064,056	1,126,687	251,834	-6,732*	333,742	358,525
Total, excluding Alaska	1,881,501	955,759	71,834	162,617	333,742	357,559
Percent of Oregon***						
Total	100.00	55.73	10.36	7.67	18.06	8.18
Total, ex- cluding Alaska	35.2	31.22	77.38	25.29	29.03	12.27

* Negative volumes explained in source list for column 4.

** Other states include: Alabama, Arkansas, Florida, Louisiana, Michigan, Minnesota, Mississippi, North Dakota, Oklahoma and Wisconsin.

*** Percentages calculated by author.

Sources for Sawtimber Volume DataColumn
Number

- 1-2 U.S. Forest Service, Timber Trends in the United States (Forest Resource Report, no. 17; Washington, D.C.: Government Printing Office, 1965), p. 155-157.
- 3 U.S. Bureau of Land Management, Public Land Statistics, 1963 (Washington, D.C.: Government Printing Office, 1964), p. 127-128.
- 4 Calculated by author using BLM volumes in column 3 and subtracting them from the "Other Public" totals in: U.S. Forest Service, Timber Trends in the United States, op. cit.

In the case of Alaska an inconsistency is apparent in the data sources and the Other Public (10,661) and the National Forest (170,928) volumes may be misleading. Because of the inconsistency in the Alaska data, a total line excluding Alaska is included.

The BLM volume of 250 million board feet in Nevada in 1963 was revised to "NA" in 1965 Public Land Statistics. It will be assumed as rhw 2 million board feet in the Timber Trends source.

- 5-6 U.S. Forest Service, Timber Trends in the United States, op. cit.

APPENDIX B

INPUT-OUTPUT MODEL SYMBOLIC NOTATION AND EXPRESSION OF THE MODEL IN MATRIX ALGEBRA NOTATION

Tables 6 through 7

- * Symbols introduced on following page.
- ** The classification terminology, official notation is regional model of planning.
- *** This model from further reports are included in questionnaire III and IV, see page. The algebraic expression of reports in questionnaire I and II.

Appendix B: Table 6
Generalized Notation for Input-Output Analysis

Input Purchasing sector (Columns) Output sector (Rows)			Purchasing Sectors				Total output use = Total supply ***
			endogenous sectors		exogenous sectors		
			Regional use (Interindustry use)**		Export use (Final use)**		Total
			Sector a j h		Total	Sector k o p	
Selling sectors	Regional sectors (producing sectors)*	Sectors a . i . h	x aa . Quadrant II . x _{ij} . x _{ha} x _{hh}	W _i	Y ak . Quadrant I . Y _{io} . Y _{hk} Y _{hp}	Y _i	X _i
	Total regional (produced) inputs			U _j		Y _o	
Nonregional Primary inputs (all prim- ary inputs)	Sectors k . m . n	V ka . Quadrant III . V _{mj} . V _{na} V _{nh}	S _m	V kk . Quadrant IV . V _{mo} . V _{nk} V _{np}	T _m	V _m	
Total nonregion- al (all) primary inputs			V _j		V _o		
Total inputs			X _j		P _o		N

* Symbolic notations on following page.

** Use classification terminology, without asterisk is regional model terminology.

*** This model form implies imports are included in quadrants III and IV, see page for alternative treatment of imports in quadrants I and II.

Adapted from: Hollis B. Chenery and Paul G. Clark, Interindustry Economics (New York, John Wiley & Sons, 1967), p.16.

Notations for Appendix B: Table 6

- Y_{io} Export (final) use by o^{th} sector of the i^{th} sector's output.
- Y_i Total export (final) use of the i^{th} sector's output equal to $\sum_{o=k}^p Y_{io}$.
- Y_o Total purchases of produced (regional) output by o^{th} final (export) use sector equals $\sum_{i=a}^n Y_{io}$.
- x_{ij} Regional (intermediate) use by j^{th} sector of i^{th} sector's output.
(Sale of output by i^{th} sector used by the j^{th} sector)
- W_i Total regional (intermediate) use of i^{th} sector's output equals $\sum_{j=a}^h x_{ij}$.
- U_j Total use of regional (intermediate) input by j^{th} sector equals $\sum_{i=a}^h x_{ij}$.
- V_{mj} Primary input of m^{th} sector used by the j^{th} sector.
- S_m Total regional (intermediate) use of the m^{th} primary input equals $\sum_{j=a}^h V_{mj}$.
- V_j Total primary input purchased by j^{th} sector equals $\sum_{m=k}^h V_{mj}$.
- V_{mo} Export (final) use of m^{th} primary input o^{th} final use (export) sector.
- T_m Total export (final) use of the m^{th} primary (import) sector equals $\sum_{o=k}^p V_{mo}$.
- V_o Total export (final) use of the o^{th} final use (export) sector equals $\sum_{m=k}^h V_{mo}$.
- X_i Total use of i^{th} endogenous sector output equals $W_i + Y_i$.
- V_m Total use of m^{th} primary input sector equals $S_m + T_m$.
- X_j Total intermediate and primary (regional and imported) input purchases by i^{th} intermediate (regional) endogenous sector, equals $U_j + V_j$.
- P_o Total final use (export) purchases by i^{th} final use (export) exogenous sector, equals $Y_o + V_o$.
- N Total transactions equals total use ($X_i + V_m$) = Total inputs ($X_j + P_o$).
- Z_i Total use of i^{th} sector instead of X_i when imports are in quadrants I and II.
- M_i Import use by i^{th} sector.
- X_i Production by i^{th} sector.

Additional Mathematical Note for Appendix B: Table 6

(Equation numbers here are integrated with those in the text of Chapter III)

The input coefficients array of quadrant II (a_{ij} 's) have an equal number (h) of rows and columns and in matrix algebra can be denoted by A . The $X_a \dots X_j \dots X_h$ values in the rows of equation (6) and (6'), page 50 and the $X_a \dots X_1 \dots X_h$ terms in its columns, on the left and right sides, respectively, may both be written as X vectors of h elements in matrix algebra and are identical (equal in every cell, $a-h$) by assumption 8. The Y_i 's are also a matrix vector, Y , of $a-h$ elements. Equation (6) may then be written in terms of matrices as (11):

$$(11) \quad AX + Y = X$$

This may be rearranged to solve for total output, X , as in equation (12) below since X appears twice in (11):

$$AX - X = -Y$$

Multiply X by the matrix form for one, the identity matrix I ,

$$AX - IX = -Y,$$

and divide through by minus one:

$$IX - AX = Y,$$

then factor X :

$$(I - A)X = Y,$$

and solve for X :

$$(12) \quad X = Y \frac{1}{(I - A)} = Y(I - A)^{-1}$$

Division is not permitted in matrix algebra, but the term $(I - A)^{-1}$, called

an inverse matrix, is equivalent. By specifying values for a new exogenous vector, Y , which differs in one or more cells from the original Y , the effect on total output can be determined for all the endogenous sectors of the region (cells of the X vector) by premultiplying the inverse by Y as in equation (12).

Equation (11) is modified as follows in (11') where Y is net exogenous use:

$$(11) \quad AX + Y = X$$

$$(11') \quad AX + Y = X + MX = Z$$

Equation (11') may be rearranged to solve for X in equation (13):

$$AX + MX - X = -Y$$

Multiply through by minus one and multiply X by I (one).

$$IX + MX - AX = Y$$

$$(I + M - A)X = Y$$

$$(13) \quad X = Y(I + M - A)^{-1}$$

Equation (13) might be used with the model form in Figures 4b and 4d, whereas equation (12) would be used with the model form in Figures 4a and 4c.

The example of the model in the text will illustrate the use of the inverse matrix shown in Table 5, page 56, and used to find the mathematical solution shown in Table 4 on the same page. Let $(I - A)^{-1}$, the inverse matrix, be represented by R and its elements denoted by r_{ij} . Each row element R , $(I - A)^{-1}$, is multiplied by the corresponding element in the Y

column and summed in the calculation of the same element of X, the total output, as shown in equation (15)

$$(15) (r_{11} \cdot Y_1) + (r_{12} \cdot Y_2) + (r_{13} \cdot Y_3) = X_1$$

In our example these are $(1.10 \cdot 24) + (0.25 \cdot 17) + (0.34 \cdot 13) = 35.07 = X_1$

This approximate calculation, with only two decimal places, illustrates the matrix multiplication process and its use in the solution of total output given some hypothetical sets of exogenous levels ($Y_i, i=1...h$). The approximate calculation of X for the original values of Y is shown below in equation (16), the hypothetical set of Y values is shown in the example in (17) and a third set shows the change of exogenous use for only the second row, manufacturing, is shown in (18).

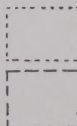
	Inverse $(I - A)^{-1}$	Exogenous = Use Y	=	Total Use (output) X $\approx$ X
(16)	$\begin{bmatrix} 1.10 & 0.25 & 0.34 \\ 0.19 & 1.47 & 0.42 \\ 0.05 & 0.11 & 1.29 \end{bmatrix}$	$\cdot \begin{bmatrix} 24 \\ 17 \\ 13 \end{bmatrix}$	=	$\begin{bmatrix} 26.40+ 4.25+ 4.42 \\ 4.56+24.95+ 5.46 \\ 1.20+ 1.87+16.84 \end{bmatrix} = \begin{bmatrix} 35.07 \\ 34.97 \\ 19.91 \end{bmatrix} \approx \begin{bmatrix} 35 \\ 35 \\ 20 \end{bmatrix}$
(17)	$\begin{bmatrix} 1.10 & 0.25 & 0.34 \\ 0.19 & 1.47 & 0.42 \\ 0.05 & 0.11 & 1.29 \end{bmatrix}$	$\cdot \begin{bmatrix} 34 \\ 27 \\ 23 \end{bmatrix}$	=	$\begin{bmatrix} 37.40+ 6.75+ 7.72 \\ 6.45+39.65+ 9.65 \\ 1.70+ 2.97+29.80 \end{bmatrix} = \begin{bmatrix} 51.97 \\ 55.75 \\ 34.24 \end{bmatrix} \approx \begin{bmatrix} 51.8 \\ 55.8 \\ 34.5 \end{bmatrix}$
(18)	$\begin{bmatrix} 1.10 & 0.25 & 0.34 \\ 0.19 & 1.47 & 0.42 \\ 0.05 & 0.11 & 1.29 \end{bmatrix}$	$\cdot \begin{bmatrix} 24 \\ 27 \\ 13 \end{bmatrix}$	=	$\begin{bmatrix} 26.40+ 6.75+ 4.42 \\ 4.56+39.65+ 5.46 \\ 1.20+ 2.97+16.84 \end{bmatrix} = \begin{bmatrix} 37.57 \\ 49.67 \\ 21.01 \end{bmatrix}$

Appendix B: Table 7
Modification of Quadrant II for the Interregional Input-Output Model

Selling sectors			Purchasing sectors		Intermediate output of subregions and region by sector a ... j ... h
			Subregion column(s)		
			s = 1	s = 2	
			Sector a ... j ... h	Sector a ... j ... h	
Subregion row (r)	r=1	Sector a i h	II Intraregional intersector trade x_{ij}^{11}	II Purchases by sectors of sub-region 2 of region 1 output x_{ij}^{12}	$\sum_{s=1}^2 x_{ij}^{rs}$
	r=2	Sector a i h	II Purchases by sectors of sub-region 1 of region 2 output x_{ij}^{21}	II Intraregional intersector trade x_{ij}^{22}	$\sum_{s=1}^2 x_{ij}^{rs}$
	Total regional input purchases by subregion and region		Sector a i h	$\sum_{r=1}^2 x_{ij}^{rs}$	$\sum_{r=1}^2 x_{ij}^{rs}$

Subregional model Quadrant II

Reaggregated regional model Quadrant II



APPENDIX C

WESTERN OREGON DATA

FOR DELINEATING SECTORS

AND SUB-REGIONS

Tables 8 through 22

Appendix C: Table 8Population

	1	2	3	4	5	6
	1950	1960	1963	1964	1967	1967
	Population	Population	Population	Population	Population	Population
			Estimate	Estimate	Estimate	as % W.Ore.
Benton	31,570	39,165	44,000	45,666	47,000	2.71
Clackamas	86,716	113,038	121,400	126,044	142,000	8.20
Clatsop	30,776	27,380	26,300	23,983	27,800	1.61
Columbia	22,967	22,379	22,700	24,213	25,000	1.44
Coos	42,265	54,955	54,000 ^e	53,114	52,200	3.01
Curry	6,048	13,983	13,700	13,268	12,500	.72
Douglas	54,549	68,458	70,500 ^e	70,247	75,000	4.33
Jackson	58,500	73,962	80,500	87,473	95,000	5.49
Josephine	26,542	29,917	30,900	34,718	36,500	2.11
Lane	125,776	162,890	180,600	190,072	204,000	11.79
Lincoln	21,308	24,635	25,500	22,425	23,550	1.36
Linn	54,317	58,867	60,200	64,029	67,000	3.87
Marion	101,401	120,888	130,700	139,301	149,500	8.63
Multnomah	471,537	522,813	537,100	541,386	555,700	32.09
Polk	26,317	26,523	28,600	33,007	33,700	1.95
Tillamook	18,606	18,955	17,500 ^e	16,184	16,000	.93
Washington	61,269	92,237	106,000 ^e	112,246	128,000	7.39
Yamhill	33,484	32,478	35,000 ^e	37,449	41,000	2.37
W. Oregon	1,373,958	1,503,523	1,585,200	1,634,825	1,731,450	100.00
County Aggregations Approximating BLM Districts:						
Salem	960,268	1,099,358	1,155,000	1,185,933	1,256,250	72.55
Eugene	125,776	162,890	180,600	190,072	204,000	11.79
Roseburg	54,549	68,458	70,500	70,247	75,000	4.33
Medford	85,052	103,879	111,400	122,191	131,500	7.59
Coos Bay	48,313	68,938	67,700	66,382	64,700	3.74

Appendix C: Table 8 Continued
Population

	7	8	9	10	11	12
	Urban Population					
	1950	1960	% Change 1950-1960	1950 % of Area Total	1960 % of Area Total	% Change in % of Urban Area Popu- lation 1950-60
Benton	16,207	20,669	27.5	51.3	52.8	2.9
Clackamas	37,999	64,074	68.6	43.8	56.7	29.5
Clatsop	16,217	15,116	-6.8	52.7	55.2	4.7
Columbia	4,711	5,022	6.6	20.5	22.4	9.3
Coos	15,845	25,993	64.0	37.5	47.3	26.1
Curry	---	2,637	---	---	18.9	---
Douglas	8,390	19,541	132.9	15.4	28.5	85.1
Jackson	25,044	33,544	33.9	42.8	46.4	8.4
Josephine	8,116	10,118	24.7	30.6	33.8	10.5
Lane	50,222	99,581	98.3	39.9	61.1	53.1
Lincoln	3,241	8,397	159.1	15.2	34.1	124.3
Linn	19,591	22,137	13.0	36.1	37.6	4.2
Marion	45,930	76,815	67.2	45.3	63.5	40.2
Multnomah	425,968	503,766	18.3	90.3	96.4	6.8
Polk	7,846	8,969	14.3	29.8	33.8	13.4
Tillamook	3,685	4,244	15.2	19.8	22.4	13.1
Washington	18,858	50,749	169.1	30.8	55.0	78.6
Yamhill	10,581	11,860	12.1	31.6	36.5	15.5
W. Oregon	718,451	983,232	36.9	56.4	65.4	16.0
County Aggregations Approximating BLM Districts:						
Salem	610,834	791,818	29.6	63.6	72.0	13.2
Eugene	50,222	99,581	98.3	39.9	61.1	53.1
Roseburg	8,390	19,541	33.9	15.4	28.5	85.1
Medford	33,160	43,662	31.7	39.0	42.0	7.7
Coos Bay	15,845	28,630	80.7	32.8	41.5	26.5

Appendix C: Table 8 Continued
Population

	13	14	15	16	17	18
	Rural Population					
	1950	1960	% Change 1950-1960	1950 % of Area Total	1960 % of Area Total	% Change in % of Rural Area Popu- lation 1950-60
Benton	15,363	18,496	20.4	48.7	47.2	-3.1
Clackamas	48,717	48,964	0.5	56.2	43.3	-23.0
Clatsop	14,559	12,264	-15.8	47.3	44.8	-5.3
Columbia	18,256	17,357	-4.9	79.5	77.6	-2.4
Coos	26,420	28,962	9.6	62.5	52.7	-15.7
Curry	6,048	11,346	87.6	100.0	81.1	-18.9
Douglas	46,159	48,917	6.0	84.6	71.5	-15.5
Jackson	33,466	40,418	20.8	57.2	54.6	-4.5
Josephine	18,426	19,799	7.5	69.4	66.2	-4.6
Lane	75,554	63,309	-16.2	60.1	38.9	-35.3
Lincoln	18,067	16,238	-10.1	84.8	65.9	-22.3
Linn	34,726	36,730	5.8	63.9	62.4	-2.3
Marion	55,471	44,073	-20.5	54.7	36.5	-33.3
Multnomah	45,569	19,047	-58.2	9.7	3.6	-6.3
Polk	18,471	17,554	-5.0	70.2	66.2	-5.7
Tillamook	14,921	14,711	-1.4	80.2	77.6	-3.2
Washington	42,411	41,488	-2.2	69.2	45.0	-35.0
Yamhill	22,903	20,618	-10.0	68.4	63.5	-7.2
W. Oregon	555,507	520,291	-6.3	43.6	34.6	-20.6
County Aggregations Approximating BLM Districts:						
Salem	349,434	307,540	-12.0	36.4	28.0	-23.1
Eugene	75,554	63,309	-16.2	60.1	38.9	-35.3
Roseburg	46,159	48,917	6.0	84.6	71.5	-15.5
Medford	51,892	60,217	16.0	61.0	58.0	-4.9
Coos Bay	32,468	40,308	24.1	67.2	58.5	-12.9

Appendix C: Table 8 Continued
Population

	19	20	21	22	23	24
	Incorporated Areas					
	1 Apr '60	1 Jul '67	% Change 1960-1967	1960 % of Area Total	1967 % of Area Total	% Change of % of Area 1960-1967
Benton	22,402	31,450	40.4	57.2	66.9	17.0
Clackamas	40,024	56,210	40.4	35.4	39.6	11.9
Clatsop	18,533	18,290	-1.3	67.7	65.8	-2.8
Columbia	9,535	11,210	17.6	42.6	44.8	5.2
Coos	30,392	34,190	12.5	55.3	65.5	18.4
Curry	5,573	5,500	-1.3	39.9	44.0	10.3
Douglas	27,124	32,430	19.6	39.6	88.4	123.2
Jackson	40,906	52,020	27.2	55.3	54.8	-0.9
Josephine	10,366	13,340	28.7	34.6	36.5	5.5
Lane	81,734	117,600	43.9	50.2	57.6	14.7
Lincoln	12,349	14,350	16.2	50.1	60.9	21.6
Linn	26,523	32,710	23.3	45.1	48.8	8.2
Marion	60,117	83,240	38.5	49.7	55.7	12.1
Multnomah	378,164	392,570	3.8	72.3	70.6	-2.4
Polk	13,927	17,925	28.7	52.5	53.2	1.3
Tillamook	8,007	7,710	-3.7	42.2	48.2	14.2
Washington	22,649	40,490	78.8	24.6	31.6	28.5
Yamhill	17,967	20,825	15.9	55.3	50.8	-8.1
W. Oregon	826,292	982,060	18.9	55.0	58.0	5.5
County Aggregations Approximating BLM Districts						
Salem	630,197	726,980	15.4	57.3	57.9	1.0
Eugene	81,734	117,600	43.9	50.2	57.6	14.7
Roseburg	27,124	32,430	19.6	39.6	88.4	123.2
Medford	51,272	65,360	27.5	49.4	49.7	0.6
Coos Bay	35,965	39,690	10.4	52.2	61.3	17.4

Appendix C: Table 8 Continued
Population

	25	26	27	28	29	30
	Unincorporated Areas					
	1 Apr '60	1 Jul '67	% Change 1960-1967	1960 % of Area Total	1967 % of Area Total	% Change of % of Area 1960-1967
Benton	16,763	15,550	-7.2	42.8	33.1	-22.7
Clackamas	73,014	85,790	17.5	64.6	60.4	-6.5
Clatsop	8,847	9,510	7.5	32.3	34.2	5.9
Columbia	12,844	13,790	7.4	57.4	55.2	-3.8
Coos	24,563	18,010	-26.7	44.7	34.5	-22.8
Curry	8,410	7,000	-16.8	60.1	56.0	-6.8
Douglas	41,344	42,570	3.0	60.4	56.8	-6.0
Jackson	33,056	42,980	30.0	44.7	45.2	1.1
Josephine	19,551	23,160	18.5	65.4	63.5	-2.9
Lane	81,156	86,400	6.5	49.8	42.4	-14.9
Lincoln	12,286	9,200	-25.1	49.9	39.1	-21.6
Linn	32,344	34,290	6.0	54.9	51.2	-6.7
Marion	60,771	66,260	9.0	50.3	44.3	-11.9
Multnomah	144,649	163,130	12.8	27.7	29.4	6.1
Polk	12,596	15,775	25.2	47.5	46.8	-1.5
Tillamook	10,948	8,290	-24.3	57.8	51.8	-10.4
Washington	69,588	87,510	25.8	75.4	68.4	-9.3
Yamhill	14,511	20,175	39.0	44.7	49.2	10.1
W. Oregon	677,231	711,077	5.0	45.2	43.5	-3.8
County Aggregations Approximating BLM Districts						
Salem	469,161	529,270	12.8	42.7	42.1	-1.4
Eugene	81,156	86,400	6.5	49.8	42.4	-14.9
Roseburg	41,334	42,570	3.0	60.4	56.8	-6.0
Medford	52,607	66,140	25.7	50.6	50.3	-0.6
Coos Bay	32,973	25,010	-24.2	47.8	38.7	-19.0

Appendix C: Table 8 Continued
Population

	31	32	33	34	35	36	37
	1960		1967		% Change 1960-67		
	County	Cities *	County	Cities*	County	Cities*	Rest of Co.
Benton	39,165	20,669	47,000	29,500	20.0	43.0	-5.4
Clackamas	113,038	26,001	142,000	37,400	25.6	43.8	20.2
Clatsop	27,380	9,986	27,800	9,200	1.5	-4.8	6.9
Columbia	22,379	5,022	25,000	5,580	11.7	11.1	11.9
Coos	54,955	14,596	52,200	22,500	-5.0	54.2	-26.4
Curry	13,983	---	12,500	---	-10.6	---	-10.6
Douglas	68,458	11,467	75,000	15,000	9.6	30.8	5.3
Jackson	73,962	33,544	95,000	41,700	28.4	24.3	31.9
Josephine	29,917	10,118	36,500	13,000	22.0	28.5	18.7
Lane	162,890	70,593	204,000	100,600	25.2	42.5	12.0
Lincoln	24,635	5,344	23,550	5,800	-4.4	8.5	-8.0
Linn	58,867	18,784	67,000	23,500	13.8	25.1	8.5
Marion	120,888	49,142	149,500	66,300	23.7	34.9	16.0
Multnomah	522,813	372,676	555,700	384,000	6.3	3.0	14.4
Polk	26,523	5,072	33,700	5,650	27.1	11.4	-2.0
Tillamook	18,955	---	16,000	---	-15.6	---	-15.6
Washington	92,237	19,797	128,000	31,500	38.8	59.1	33.2
Yamhill	32,478	7,656	41,000	9,100	26.2	18.2	28.5
W. Oregon	1,503,523	680,467	1,731,450	800,330	15.2	17.6	12.2
County Aggregations Approximating ELM Districts:							
Salem	1,099,358	540,149	1,256,250	607,530	14.3	12.5	14.5
Eugene	162,890	70,593	204,000	100,600	25.2	42.5	12.0
Roseburg	68,458	11,467	75,000	15,000	9.6	30.8	5.3
Medford	103,879	43,662	131,500	54,700	26.6	25.3	27.5
Coos Bay	68,938	14,596	64,700	22,500	-6.1	54.2	-22.3

* Over 5000 inhabitants in 1960.

Notes on Sources of Population DataColumn
Number

- 1 Oregon Economic Statistics, 1968 (Eugene: Bureau of Business and Economic Research, University of Oregon, 1968), p.6.
- 2 Ibid., p.3.
- 3 "Survey of Buying Power," Sales Management, June 10, 1963, p.973.
Note: Data denoted by "e" indicates a revision by the author (based on a time series: 1960, 1964, 1967) of the original estimates as cited in the source.
- 4 Agriculture in Oregon (6th ed.; Salem: State Dept. of Agriculture, 1965), p.51-52.
- 5 Oregon Economic Statistics, op. cit., p.3.
- 6 Calculations by author based on column 5.
- 7 Oregon Economic Statistics, op. cit., p.6.
- 8 Ibid.
- 9 Calculations by author based on columns 7 and 8.
- 10 Calculations by author based on columns 1 and 7.
- 11 Calculations by author based on columns 2 and 8.
- 12 Calculations by author based on columns 10 and 11.
- 13 Oregon Economic Statistics, op. cit., p.6.
- 14 Ibid.
- 15 Calculations by author based on columns 13 and 14.
- 16 Calculations by author based on columns 1 and 13.
- 17 Calculations by author based on columns 2 and 14.
- 18 Calculations by author based on columns 16 and 17.
- 19 Oregon Economic Statistics, op. cit., p.7.
- 20 Ibid.
- 21 Calculations by author based on columns 19 and 20.
- 22 Calculations by author based on columns 1 and 19.
- 23 Calculations by author based on columns 5 and 20.
- 24 Calculations by author based on columns 22 and 23
- 25 Oregon Economic Statistics, op. cit., p. 7.
- 26 Ibid.

Notes on Sources of Population Data (Continued)

Column
Number

- 27 Calculations by author based on columns 25 and 26.
- 28 Calculations by author based on columns 1 and 25.
- 29 Calculations by author based on columns 5 and 26.
- 30 Calculations by author based on columns 28 and 29.
- 31 Oregon Economic Statistics, op. cit., p. 3.
- 32 Ibid., p.4.
- 33 Ibid., p.3.
- 34 Ibid., p.4.
- 35 Calculations by author based on columns 31 and 33.
- 36 Calculations by author based on columns 32 and 34.
- 37 Calculations by author based on columns 31-34.

Appendix C: Table 9
Labor Force and Employment, 1967 *

	1	2	3	4	5	6
	Civilian	1967 Unemployment		Employment		
	Labor Force '67	Number	Percent	Total	Agriculture	Non-Agric.
Benton	21,960	890	4.1	21,070	1,200	19,870
Clackamas**	39,500	1,595	4.0	37,910	4,500	33,410
Clatsop	12,280	700	5.7	11,580	550	11,030
Columbia	8,230	480	5.8	7,750	1,010	6,740
Coos*	21,990	1,410	6.4	20,570	830	19,740
Curry*	4,710	260	5.5	4,450	350	4,100
Douglas	28,700	2,540	8.9	26,160	1,730	24,430
Jackson	36,010	2,680	7.4	33,330	2,920	30,410
Josephine	13,080	1,350	10.3	11,730	1,380	10,350
Lane	81,300	5,050	6.2	76,250	3,950	72,300
Lincoln*	8,550	560	6.5	7,990	260	7,730
Linn	25,750	1,770	6.9	23,980	2,930	21,050
Marion***	61,300	3,800	6.2	57,500	1,400	6,600
Multnomah**	303,750	10,280	4.0	291,600	1,800	289,800
Polk***	8,500	500	6.2	8,000	1,400	6,600
Tillamook	6,080	300	4.9	5,780	790	4,990
Washington**	40,000	1,600	4.0	38,400	3,600	34,800
Yamhill	12,690	960	7.5	11,830	2,450	9,380
W. Oregon	734,480	36,725	5.0	695,880	38,650	657,230
County Aggregations Approximating BLM Districts:						
Salem	548,690	23,435	4.3	523,390	27,490	495,900
Eugene	81,300	5,050	6.2	76,250	3,950	72,300
Roseburg	28,700	2,540	8.9	26,160	1,730	24,430
Medford	49,090	4,030	8.2	45,060	4,300	40,760
Coos Bay	26,700	1,670	6.3	25,020	1,180	23,840

* Coos, Curry and Lincoln Counties use 1966 data.

** Totals for Clackamas, Multnomah and Washington Counties obtained for columns 4 to 8 from Mr. Lee Russell, see sources, and other columns and allocations to the three counties made by author using covered employment ratios.

*** Marion and Polk totals allocated to counties by author using covered employment ratios.

Appendix C: Table 9 Continued
Labor Force and Employment, 1967*

	7	8	9	10	11	12
	Non-Agriculture		Manufacturing			
	Self-employ. Unpaid, Dom- estic	Wage, Salary	Total	Lumber, Wood Pro- ducts*	Food & Kindred*	Other Manufac- turing
Benton	2,610	17,260	2,450	1,580	250 ^e	620
Clackamas**	7,450	25,960	8,270	2,590	440	5,240
Clatsop	1,530	9,500	3,020	1,140	1,240 ^e	640
Columbia	1,300	5,440	2,290	1,100	60 ^e	1,130
Coos	2,800	16,940	7,000	6,020	700 ^e	280
Curry	580	3,520	1,750	1,650	100	0
Douglas	4,100	20,330	8,130	6,850	250 ^e	1,030
Jackson	4,750	25,660	6,130	4,740	480	910
Josephine	1,660	8,690	2,500	1,870	90	540
Lane	10,050	62,250	18,400	14,250	1,500	2,650
Lincoln	1,110	6,620	2,100	1,280	350 ^e	470
Linn	2,960	18,096	7,580	4,914 ^e	770	1,896
Marion***	7,500	43,000	6,950	1,000	3,440 ^e	2,510
Multnomah**	30,500	259,300	50,200	5,850	7,200 ^e	37,150
Polk***	600	6,000	2,850	1,600	650 ^e	600
Tillamook	700	4,290	1,820	1,510	270 ^e	40
Washington**	6,650	28,150	12,630	960	1,300 ^e	10,370
Yamhill	1,320	8,060	2,250	810	550	890
W. Oregon	88,170	568,960	146,320	59,714	19,640	66,966
County Aggregations Approximating BLM Districts:						
Salem	64,230	431,570	102,410	24,334	16,520	61,556
Eugene	10,050	62,250	18,400	14,250	1,500	2,650
Roseburg	4,100	20,330	8,130	6,850	250	1,030
Medford	6,410	34,350	8,630	6,610	570	1,450
Coos Bay	3,380	20,460	8,756	7,670	800	280

* Coos, Curry and Lincoln Counties use 1966 data.

** Totals for Clackamas, Multnomah and Washington Counties obtained for columns 4 to 8 from Mr. Lee Russell, see sources, and other columns and allocations to the three counties made by author using covered employment ratios.

*** Marion and Polk totals allocated to counties by author using covered employment ratios.

**** Covered employment data used to estimate entries indicated by an "e".

Appendix C: Table 9 Continued
Labor Force and Employment, 1967*

	13	14	15	16	17	18	19	20
	Non Manufacturing							
	Total	Cons- truction	Transpor- tation, Commercial Utility	Whole- sale, Retail Trade	Finance	Service	Govern- ment	Other Non- Manu- fac.
Benton	14,810	480	560	2,360	420	1,870	9,120	1,400
Clackamas**	17,690	1,510	760	6,800	1,180	3,570	3,780	0
Clatsop	6,480	1,000	540	1,690	270	1,360	1,620	0
Columbia	3,150	710	250	770	120	390	910	0
Coos*	9,940	580	1,460	2,810	690	2,030	2,370	0
Curry*	1,770	110	90	580	120	250	620	0
Douglas	12,200	560	940	3,140	790	2,180	4,280	310
Jackson	19,530	1,050	1,680	5,920	1,340	3,700	5,840	0
Josephine	6,190	290	480	1,710	490	1,180	2,040	0
Lane	43,850	3,050	3,900	12,000	2,650	8,150	14,100	0
Lincoln*	4,520	330	410	1,310	260	1,010	1,200	0
Linn	10,510	990	1,040	3,150	610	1,930	2,790	0
Marion**	36,050	2,200	1,560	8,800	2,520	5,930	1,504	0
Multnomah**	209,110	11,210	23,640	67,600	17,700	42,270	46,690	0
Polk**	3,150	200	140	1,000	280	570	960	0
Tillamook	2,470	90	160	690	130	520	880	0
Washington**	15,520	1,720	1,700	6,150	1,230	3,060	1,660	0
Yamhill	5,810	420	330	1,750	460	1,520	1,330	0
W. Oregon	234,551	26,500	39,640	128,230	31,260	81,490	115,230	1,710
County Aggregations Approximating BLM Districts:								
Salem	141,071	20,860	31,090	102,070	25,180	64,000	85,980	1,400
Eugene	43,850	3,050	3,900	12,000	650	8,150	14,100	0
Roseburg	12,200	560	940	3,140	790	2,180	4,280	310
Medford	25,720	134	2,160	7,630	1,830	4,880	7,880	0
Coos Bay	11,710	690	1,550	3,390	810	2,280	2,990	0

* Coos, Curry and Lincoln Counties use 1966 data.

** Totals for Clackamas, Marion, Multnomah, Polk and Washington Counties allocated by author using covered employment ratios.

Appendix C: Table 9 Continued
Labor Force and Employment, 1967*

	21	22	23	24	25	26	27	28	29
	Non-Ag. Employ.	Mfg. Employ.	Mfg. Employ.	Lumber & Wood Products Employ.	Lumber & Wood Employ.	Const. Employ.	Service Employ.	Finance Employ.	Govt. Employ.
	As % of Total Employ.	As % of Total Employ.	As % of Wage & Salary Employ.	As % of Total Employ.	As % of Mfg. Employ.	As % of Total Employ.	As % of Total Employ.	As % of Total Employ.	As % of Total Employ.
Benton	94.3	11.6	14.2	7.5	64.5	2.3	8.9	2.0	43.3
Clackamas**	88.1	21.9	31.9	6.8	31.3	4.0	9.4	3.1	10.0
Clatsop	95.3	26.1	31.8	9.8	37.7	8.6	11.7	2.3	14.0
Columbia	87.0	29.5	42.1	14.2	48.0	9.2	5.0	1.5	11.7
Coos*	96.0	34.1	41.3	29.3	86.0	2.8	9.9	3.4	11.5
Curry*	92.1	39.5	49.7	37.1	94.3	2.5	5.6	2.7	13.9
Douglas	93.4	31.2	40.0	26.2	84.3	2.1	8.3	3.0	16.4
Jackson	91.2	18.4	23.9	14.2	77.3	3.2	11.1	4.0	17.5
Josephine	88.2	21.3	28.8	15.9	74.8	2.5	10.1	4.2	17.4
Lane	94.8	24.1	29.6	18.7	77.4	4.0	10.7	3.5	18.5
Lincoln*	96.7	26.2	31.7	16.0	61.0	4.1	12.6	3.3	15.0
Linn	87.8	31.5	41.9	20.5	64.8	4.1	8.0	2.5	11.6
Marion**	87.8	12.1	16.2	1.7	14.4	3.8	10.3	4.4	26.2
Multnomah**	99.4	17.2	19.4	2.0	11.7	3.8	14.5	6.1	16.0
Polk**	82.5	35.5	47.5	20.0	56.1	2.5	7.1	3.5	12.0
Tillamook	86.3	31.5	42.4	26.1	83.0	1.6	9.0	2.2	15.2
Washington**	90.6	33.0	44.9	2.5	7.6	4.5	8.0	3.2	4.3
Yamhill	79.3	19.0	27.9	6.8	36.0	3.6	12.8	3.9	11.2
W. Oregon	94.4	19.6	25.7	8.6	40.8	3.8	11.7	4.5	16.6
County Aggregations Approximating BLM Districts:									
Salem	94.7	19.6	23.7	4.7	23.8	4.0	12.2	4.8	16.4
Eugene	94.8	24.1	29.6	18.7	77.4	4.0	10.7	3.5	18.5
Roseburg	93.4	31.2	40.0	26.2	84.3	2.1	8.3	3.0	16.4
Medford	90.5	19.2	25.1	14.7	76.6	3.0	10.8	4.1	17.5
Coos Bay	95.3	35.0	42.9	30.7	87.7	2.8	9.1	3.2	12.0

* Coos, Curry and Lincoln Counties use 1966 data.

** Totals for Clackamas, Marion, Multnomah, Polk and Washington Counties allocated by author using covered employment ratios.

Appendix C: Table 2 Continued
Labor Force and Employment, 1967*

	30	31	32	33	34	35	36	37
	Average Covered Employ.	Covered Mfg. Employ.	Covered Non-Mfg Employ.	Covered Employ. As % of Total Employ	Mfg As % of Total Covered Employ	Covered Non-Mfg Employ As % of Total Employ	Covered Mfg Employee's Payroll (\$1000)	Yearly Covered Payroll (\$1000)
Benton	10,270	2,453	7,817	48.7	23.9	37.1	16,383	53,447
Clackamas**	22,120	8,267	13,853	58.3	37.4	36.5	56,009	130,992
Clatsop	7,884	3,012	4,872	68.1	38.2	26.0	19,595	46,717
Columbia	4,539	2,291	2,248	58.6	50.5	29.0	16,499	29,922
Coos*	13,918	6,945	6,973	67.7	49.9	33.9	45,983	84,866
Curry*	2,857	1,739	1,118	64.2	60.9	25.1	11,069	15,914
Douglas	16,412	8,128	8,284	62.7	49.5	31.7	56,864	100,264
Jackson	18,953	6,097	12,856	56.9	32.2	38.6	44,795	112,022
Josephine	6,522	2,497	4,025	55.6	38.3	34.3	16,616	35,674
Lane	46,508	18,363	28,145	61.0	39.5	36.9	126,675	276,095
Lincoln*	5,653	2,097	3,556	70.8	37.1	44.5	13,026	29,930
Linn	15,040	7,682	7,358	62.7	51.1	30.7	53,289	92,194
Marion**	35,264	6,905	28,359	61.3	19.6	49.3	41,474	199,038
Multnomah**	213,965	50,194	163,771	73.4	23.5	56.2	367,364	1,390,335
Polk**	5,053	2,835	2,218	63.2	56.1	27.7	18,394	27,868
Tillamook	3,439	183	1,608	59.5	53.2	27.9	11,347	18,654
Washington**	24,785	12,629	12,156	64.5	51.0	31.7	85,303	150,772
Yamhill	6,283	2,263	4,020	53.1	36.0	34.9	13,739	32,224
W. Oregon	459,465	146,228	313,237	66.0	31.8	45.0	1,014,877	2,826,928
County Aggregations Approximating BLM Districts:								
Salem	354,295	102,459	251,836	67.7	22.9	48.1	712,876	2,202,091
Eugene	46,508	18,363	28,145	61.0	39.5	36.9	126,675	276,095
Roseburg	16,412	8,128	8,284	62.7	49.5	31.7	56,864	100,264
Medford	25,475	8,594	16,881	56.5	33.7	37.5	61,411	147,696
Coos Bay	16,775	8,684	8,091	67.0	51.8	32.3	57,051	100,781

* Coos, Curry and Lincoln Counties use 1966 data.

** Totals for Clackamas, Marion, Multnomah, Polk and Washington Counties allocated by author using covered employment ratios.

Appendix C: Table 9 Continued
Labor Force and Employment

	38	39	40	41	42
	Total Covered Employment 1966				
	Avg. Mo. Employment	Employment as % W. Ore. Total	Total Annual Payrolls (\$1000)	Area Pay- roll as % of W. Ore.	Avg. Annual Payroll per Worker
Benton	9,799	2.16	49,845	1.84	5,087
Clakamas	21,098	4.64	121,190	4.48	5,744
Clatsop	7,654	1.68	45,255	1.67	5,913
Columbia	4,273	.94	26,338	.97	6,164
Coos	14,159	3.11	84,787	3.14	5,988
Curry	2,951	.65	16,864	.62	5,715
Douglas	17,390	3.82	103,771	3.84	5,967
Jackson	19,386	4.26	111,788	4.13	5,766
Josephine	6,878	1.51	37,217	1.38	5,411
Lane	47,275	10.40	273,050	10.09	5,776
Lincoln	5,514	1.21	29,076	1.08	5,273
Linn	15,809	3.48	96,234	3.56	6,087
Marion	34,672	7.63	187,330	6.92	5,403
Multnomah	210,654	46.32	1,315,577	48.62	6,245
Polk	5,044	1.11	26,509	.98	5,256
Tillamook	3,272	.72	17,374	.64	5,310
Washington	23,070	5.07	135,368	5.00	5,868
Yamhill	5,876	1.29	28,200	1.04	4,799
W. Oregon	454,774	100.00	2,705,773	100.00	5,950
County Aggregations Approximating BLM Districts:					
Salem	346,735	76.24	2,078,296	76.81	5,994
Eugene	47,275	10.40	273,050	10.09	5,776
Roseburg	17,390	3.82	103,771	3.84	5,967
Medford	26,264	5.78	149,005	5.51	5,673
Coos Bay	17,110	3.76	101,651	3.75	5,941

Appendix C: Table 9 Continued
Labor Force and Employment

	43	44	45	46	47	48	49
	Covered Manufacturing 1963 & 1966						1966 Mfg
	Total Payrolls (\$1000)			Average Employment			As % of
	1966	1963	% Change	1966	1963	% Change	Total Payroll
Benton	16,599	12,489	32.91	2,597	2,238	16.04	33.30
Clackamas	53,749	38,605	39.23	8,132	6,547	24.21	44.35
Clatsop	16,497	13,020	26.71	2,687	2,492	7.83	36.45
Columbia	16,736	12,775	31.01	2,447	2,168	13.13	63.54
Coos	45,617	34,235	33.25	6,997	6,095	14.80	53.80
Curry	11,621	12,734	-8.74	1,747	2,127	-17.87	68.91
Douglas	57,942	49,265	17.61	8,587	8,166	5.16	55.84
Jackson	44,857	34,440	30.25	6,425	5,476	17.33	40.13
Josephine	16,961	14,453	17.35	2,589	2,457	5.37	45.57
Lane	129,212	102,208	26.42	19,171	17,077	12.26	47.32
Lincoln	13,373	12,160	9.98	2,103	2,130	-1.27	18.14
Linn	51,735	39,629	30.55	7,778	6,779	14.74	53.76
Marion	41,427	33,097	25.17	7,155	6,465	10.67	22.11
Multnomah	360,050	270,351	33.18	51,087	43,283	18.03	27.36
Polk	17,718	15,260	16.11	2,893	2,865	.98	66.84
Tillamook	10,502	8,773	19.71	1,713	1,619	5.81	60.45
Washington	78,245	44,854	74.44	12,126	8,074	50.19	57.80
Yamhill	12,370	10,634	16.32	2,177	2,039	6.77	43.87
W. Oregon	995,211	758,982	31.12	148,411	128,097	15.86	36.78
County Aggregations Approximating BLM Districts:							
Salem	689,001	511,647	33.29	102,895	86,699	17.62	33.15
Eugene	129,212	102,208	26.42	19,171	17,077	12.26	47.32
Roseburg	57,942	49,265	17.61	8,587	8,166	5.16	55.84
Medford	61,818	48,893	26.44	9,014	7,933	13.63	41.49
Coos Bay	57,238	46,969	21.86	8,744	8,222	6.35	56.31

Appendix C: Table 2 Continued
Labor Force and Employment

	50	51	52	53	54	55	56	57
	Employment Size Class -- March 1967							
No. of Employees Mid-Mar Pay Per.	Taxable Payroll Jan-Mar (\$1000)	Total Re- porting Units	No. of Reporting Units by Size Class					
			1-7	8-19	20-49	50-99	100+	
Benton	7,193	8,558	844	646	116	52	24	6
Clackamas	18,408	23,738	1,868	1,401	309	114	20	24
Clatsop	7,302	9,701	696	532	107	30	14	13
Columbia	4,523	6,452	416	346	42	19	1	8
Coos	13,214	18,607	1,119	867	149	59	20	24
Curry	2,778	3,590	292	242	37	3	3	7
Douglas	14,822	20,288	1,283	973	196	60	24	30
Jackson	17,059	22,282	1,773	1,343	283	93	33	21
Josephine	6,353	8,109	719	565	96	35	15	8
Lane	46,177	62,529	3,716	2,689	630	247	79	71
Lincoln	4,691	5,491	632	510	82	28	8	4
Linn	15,229	20,649	1,227	921	177	74	30	25
Marion	25,518	31,550	2,559	1,892	419	170	45	33
Multnomah	208,825	307,756	12,928	8,791	2,269	1,140	410	318
Polk	4,168	5,538	419	326	55	25	7	6
Tillamook	3,138	3,853	413	343	47	14	4	5
Washington	23,057	29,457	1,717	1,280	268	106	39	24
Yamhill	5,755	6,422	682	530	89	42		7
W. Oregon	428,210	594,570	33,303	24,197	5,371	2,311	790	634
County Aggregations Approximating BLM Districts:								
Salem	327,807	459,165	24,401	17,518	3,980	1,814	616	473
Eugene	46,177	62,529	3,716	2,689	630	247	79	71
Roseburg	14,822	20,288	1,283	973	196	60	24	30
Medford	23,412	30,331	2,492	1,908	379	128	48	29
Coos Bay	15,992	22,197	1,411	1,109	186	62	23	31

Appendix C: Table 9 Continued
Labor Force and Employment

	58	59	60	61	62	63	64	65
	Covered Employment July 1967*							
	Total	All Mfg.	SIC 24: Lumber & Wood Prod.	SIC 26: Paper & Allied Prod.	SIC 24 As % of Mfg.	SIC 26 As % of Mfg.	SIC 24 + 26 As % of Mfg.	SIC 24 + 26 As % of Total
Benton	10,311	2,572	1,668	---	64.85	---	64.85	16.17
Clackamas	23,360	8,904	2,368	2,238	26.59	25.13	51.72	19.72
Clatsop	8,129	3,056	1,181	---	38.65	---	38.64	14.53
Columbia	4,776	2,336	1,147	935	49.10	40.03	89.13	43.59
Coos	14,633	7,534	6,232	205	82.72	2.72	85.44	43.99
Curry	3,178	1,868	1,664	---	89.08	---	89.08	52.36
Douglas	17,207	8,378	6,985	---	83.37	---	83.37	40.59
Jackson	19,772	6,427	5,172	---	80.47	---	80.47	26.16
Josephine	7,022	2,614	2,024	---	77.43	---	77.43	28.82
Lane	47,971	18,830	14,124	---	75.01	---	75.01	29.44
Lincoln	6,449	2,346	1,200	---	51.15	---	51.15	18.61
Linn	15,620	8,053	5,030	---	62.46	---	62.46	32.20
Marion	37,374	8,972	1,168	752	13.02	8.38	21.40	5.14
Multnomah	217,240	50,663	5,061	1,720	9.99	3.39	13.38	3.12
Polk	5,270	2,928	1,570	---	53.62	---	53.62	29.79
Tillamook	3,652	1,902	1,569	---	82.49	---	82.49	42.96
Washington	25,414	12,847	842	188	6.55	1.46	8.01	4.05
Yamhill	6,449	2,435	901	---	37.00	---	37.00	13.97
W. Oregon	473,827	152,665	59,906	6,038	39.24	3.96	41.23	13.28
County Aggregations Approximating ELM Districts:								
Salem	364,044	107,014	23,705	5,833	22.13	5.45	27.60	8.11
Eugene	47,971	18,830	14,124	---	75.01	---	75.01	29.44
Roseburg	17,207	8,378	6,985	---	83.37	---	83.37	40.59
Medford	26,794	9,041	7,196	---	79.59	---	79.59	26.85
Coos Bay	17,811	9,402	7,896	205	83.98	2.18	86.16	45.42

* Reported by county.

Sources of Labor Force and Employment Data

Column
Number

1-20 Data for this compilation was taken from printed looseleaf sheets issued by the Oregon State Dept. of Employment Research and Statistics Division from June 1967- Jan. 1969.

Labor force data was issued for each county individually, with two exceptions: (1) the combining of Marion and Polk counties, and (2) the Portland Metropolitan area, comprising Clackamas, Multnomah and Washington counties (as well as Clark County, Washington). Data for columns 4 to 8 for Clackamas, Multnomah and Washington counties was obtained from Mr. Lee Russell, of the Research and Statistics Division, in a phone conversation on Feb. 14, 1969. Other totals were derived by the author using covered employment ratios.

All data is for 1967, except for Coos, Curry and Lincoln counties for which it was necessary to use 1966 data.

- 21 Calculations by author based on columns 4 and 6.
- 22 Calculations by author based on columns 4 and 9.
- 23 Calculations by author based on columns 8 and 9.
- 24 Calculations by author based on columns 4 and 10.
- 25 Calculations by author based on columns 9 and 10.
- 26 Calculations by author based on columns 4 and 14.
- 27 Calculations by author based on columns 4 and 18.
- 28 Calculations by author based on columns 4 and 17.
- 29 Calculations by author based on columns 4 and 19.
- 30 Oregon. State Dept. of Employment. Research and Statistics Division, Oregon Covered Employment and Payrolls by Industry, County, and Month (Including Yearly Summary Data) 1967 (Salem: 1968), p.21.
- 31 Ibid., p.28.
- 32 Calculations by author based on columns 30 and 31.
- 33 Calculations by author based on columns 4 and 30.
- 34 Calculations by author based on columns 9 and 30.
- 35 Calculations by author based on columns 4 and 32.
- 36 Oregon. State Dept. of Employment. Research and Statistics Division, Oregon Covered Employment and Payrolls, 1967, op. cit., p. 28.

Sources of Labor Force and Employment Data -- Continued

Column
Number

- 37 Ibid., p.21.
- 38 Oregon Economic Statistics, 1968 (Salem: Bureau of Business and Economic Research, University of Oregon, 1968), p.19.
- 39 Calculations by author based on column 38.
- 40 Oregon Economic Statistics, 1968, op. cit., p.19.
- 41 Calculations by author based on column 40.
- 42 Oregon Economic Statistics, 1968, op. cit., p. 19.
- 43 Ibid., p.76.
- 44 Ibid.
- 45 Calculations by author based on columns 43 and 44.
- 46 Oregon Economic Statistics, 1968, op. cit., p. 76.
- 47 Ibid.
- 48 Calculations by author based on columns 46 and 47.
- 49 Calculations by author based on columns 40 and 43.
- 50-57 U.S. Bureau of the Census, 1967 County Business Patterns (CBP-67-39, Oregon; Washington, D.C.: U.S. Government Printing Office, 1968), p.111.
- 58-61 Oregon. Dept. of Employment. Research and Statistics Division, Oregon Covered Employment and Payrolls by Industry and County, Third Quarter, 1967 (Salem: 1967), p.23-92.
- 62 Calculations by author based on columns 59 and 60.
- 63 Calculations by author based on columns 59 and 61.
- 64 Calculations by author based on columns 59, 60 and 61.
- 65 Calculations by author based on columns 58, 60 and 61.

Appendix C: Table 10
Manufacturing

	1	2	3	4	5	6	7
	Manufacturing, 1963						
	All Employees		Production Workers			Wages	Value
	Annual Average	Payroll Entire Yr. (\$1000s)	Annual Average	Man- Hours (1000s)	Wages Entire Yr. (\$1000s)	per Prod. Worker (\$1000s)	Added by Mfg.
Benton	2,322	12,880	2,069	4,146	11,133	5.38	22,057
Clackamas	5,975	34,751	4,977	9,764	26,805	5.39	81,212
Clatsop	2,399	11,761	2,172	3,695	9,974	4.59	26,064
Columbia	2,202	12,655	1,974	3,845	10,806	5.47	31,932
Coos	6,388	35,409	5,607	11,299	29,818	5.32	69,223
Curry	1,957	10,606	1,798	3,541	9,875	5.49	22,290
Douglas	8,183	47,553	7,281	14,239	41,290	5.67	83,264
Jackson	5,156	30,793	4,477	8,920	25,552	5.71	59,849
Josephine	2,458	14,067	2,225	4,203	12,284	5.52	25,612
Lane	18,250	100,897	15,579	29,577	81,634	5.24	183,638
Lincoln	2,010	11,222	1,744	3,401	9,488	5.44	24,243
Linn	7,328	40,617	6,291	12,167	33,378	5.31	72,498
Marion	6,100	29,999	5,150	9,583	23,611	4.58	68,546
Multnomah	42,119	255,464	29,567	57,667	161,504	5.46	470,072
Polk	2,833	14,462	2,519	4,537	12,139	4.82	36,570
Tillamook	1,527	8,057	1,379	2,564	7,059	5.12	13,469
Washington	8,458	47,548	5,965	11,044	28,769	4.82	86,729
Yamhill	2,061	9,930	1,681	2,988	7,381	4.39	19,057
W. Oregon	127,726	728,671	102,455	197,180	542,500	5.30	1,396,325
County Aggregations Approximating BLM Districts:							
Salem	85,334	489,346	65,488	125,401	342,047	5.22	952,449
Eugene	18,250	100,897	15,579	29,577	81,634	5.24	183,638
Roseburg	8,183	47,553	7,281	14,239	41,290	5.67	83,264
Medford	7,614	44,860	6,702	13,123	37,836	5.65	85,461
Coos Bay	8,345	46,015	7,405	14,840	39,693	5.36	91,513

Appendix C: Table 10 Continued
Manufacturing

	8	9	10	11	12	13	14	15
	Manufacturing 1963				Manufacturing 1958		% Change 1958-63	
	Value Added	Capital Expend.	Lumber and Wood Products					
	per	New	Value	% of	All Mfg.	Value Added	All Mfg.	Value
	Prod. Worker (\$1000)	(\$1000)	Added (\$1000)	Total Value Added	Employees	(\$1000)	Employ-ees	Added
Benton	10.66	2,080	16,711	75.8	2,134	19,141	8.9	15.2
Clackamas	16.32	9,404	13,852	17.1	5,235	58,486	14.2	41.6
Clatsop	12.00	1,912	10,928	41.9	2,591	20,381	-7.4	27.9
Columbia	16.18	2,541	---	---	1,925	29,588	14.4	7.9
Coos	12.35	7,061	61,559	88.9	6,790	56,239	-5.9	24.8
Curry	12.40	1,337	22,088	99.1	1,682	15,379	16.3	44.4
Douglas	11.44	7,855	75,559	90.7	8,163	83,945	0.0	-0.8
Jackson	13.37	5,690	50,508	84.4	5,008	43,090	2.9	38.9
Josephine	11.51	2,826	23,411	91.4	2,346	18,231	4.8	38.6
Lane	11.79	16,166	139,384	75.9	14,167	121,121	28.8	51.6
Lincoln	13.90	8,375	11,477	47.3	2,449	13,822	-13.8	82.5
Linn	11.52	11,787	57,346	79.1	6,351	56,086	15.4	29.2
Marion	13.31	5,474	12,710	18.5	5,320	45,424	14.7	50.8
Multnomah	15.90	26,176	36,189	7.7	40,962	390,272	3.1	20.3
Polk	14.52	1,604	25,405	69.5	2,698	26,313	5.0	38.6
Tillamook	9.77	1,799	---	---	2,445	18,250	-33.4	-26.0
Washington	14.54	4,512	8,688	10.0	4,297	47,891	97.0	81.2
Yamhill	11.34	1,563	7,111	37.3	1,890	15,625	9.1	22.0
W. Oregon	13.63	118,162	572,926	41.0	116,453	1,079,284	9.7	29.4
County Aggregations Approximating BLM Districts:								
Salem	14.54	77,227	200,417	21.0	78,297	741,279	9.0	28.5
Eugene	11.79	16,166	139,384	75.9	14,167	121,121	28.8	51.6
Roseburg	11.44	7,855	75,559	90.7	8,163	83,945	0.0	-0.8
Medford	12.75	8,516	73,919	86.5	7,354	61,321	3.5	39.4
Coos Bay	12.36	8,398	83,647	91.4	8,472	71,618	-1.5	27.8

Sources of Manufacturing Data

Column
Number

- 1-5 U.S. Bureau of the Census, County and City Data Book, 1967
(Washington, D.C.: Government Printing Office, 1968), p.306.
- 6 Calculations by author based on columns 3 and 5.
- 7 U.S. Bureau of the Census, County and City Data Book, 1967, op. cit.
- 8 Calculations by author based on columns 3 and 7.
- 9 U.S. Bureau of the Census, County and City Data Book, 1967, op. cit.
- 10 Ibid., p.307.
- 11 Calculations by author based on columns 7 and 10.
- 12-13 U.S. Bureau of the Census, County and City Data Book, 1967, op. cit., p.306.
- 14 Calculations by author based on columns 1 and 12.
- 15 Calculations by author based on columns 7 and 13.

Appendix C: Table 11
Earnings

	1	2	3	4	5	6
	Estimated Households 1967 (1000s)	Net Effective Buying Income 1967 Dollars (\$1000)	% of W. Ore.	Per Household	Public Assistance Recipients, 1964 Number	% of Pop.
Benton	13.2	123,325	2.69	9,343	441	0.97
Clackamas	47.1	391,706	8.53	8,316	2,778	2.20
Clatsop	9.2	64,875	1.41	7,052	701	2.92
Columbia	7.9	52,239	1.14	6,613	666	2.75
Coos	17.0	129,355	2.82	7,609	1,311	2.47
Curry	4.0	31,738	0.69	7,935	196	1.48
Douglas	22.5	171,489	3.73	7,622	1,999	2.85
Jackson	30.0	225,187	4.90	7,506	1,749	2.00
Josephine	12.1	84,289	1.84	6,966	1,385	3.99
Lane	62.3	523,957	11.41	8,410	4,167	2.19
Lincoln	7.7	52,134	1.14	6,771	745	3.32
Linn	20.1	144,276	3.14	7,178	1,823	2.85
Marion	44.0	355,954	7.75	8,090	4,516	3.24
Multnomah	195.9	1,666,808	36.30	8,508	22,757	4.20
Polk	10.4	73,352	1.60	7,053	718	2.18
Tillamook	5.0	36,651	0.80	7,330	363	2.24
Washington	39.4	384,457	8.37	9,758	1,739	1.55
Yamhill	11.6	79,623	1.74	6,864	1,352	3.61
W. Oregon	559.4	4,591,415	100.00	8,208	49,406	3.02
County Aggregations Approximating BLM Districts:						
Salem	411.5	3,425,400	74.60	8,324	38,599	3.25
Eugene	62.3	523,957	11.41	8,410	4,167	2.19
Roseburg	22.5	171,489	3.74	7,622	1,999	2.85
Medford	42.1	309,476	6.74	7,351	3,134	2.56
Coos Bay	21.0	161,093	3.51	7,671	1,507	2.27

Appendix C: Table 11 Continued
Earnings

	7	8	9	10	11	12	11	14	15	16
	Households by Cash Income Groups 1967									
	A		B		C		D		E	
	\$0-2999		\$3000-4999		\$5000-7999		\$8000-9999		\$10000 & over	
	%	Number	%	Number	%	Number	%	Number	%	Number
Benton	21.2	2,798	15.7	2,072	29.8	3,934	13.2	1,743	20.1	2,653
Clackamas	20.0	9,420	13.1	6,170	32.9	15,449	14.4	6,782	19.7	9,279
Clatsop	27.1	2,493	17.1	1,573	29.5	2,714	11.8	1,086	14.5	1,334
Columbia	26.5	2,094	16.6	1,311	33.7	2,662	11.4	901	11.8	932
Coos	20.7	2,380	14.0	2,380	34.4	5,848	13.3	2,261	17.6	2,992
Curry	18.1	724	13.9	556	34.4	1,376	15.4	616	18.2	728
Douglas	19.7	4,433	15.1	3,398	35.5	7,983	13.7	3,082	16.0	3,600
Jackson	24.3	7,290	15.5	4,650	32.2	9,660	12.4	3,720	15.6	4,680
Josephine	28.0	3,388	16.9	2,045	30.9	3,739	10.2	1,234	14.0	1,694
Lane	17.7	11,027	14.2	8,847	34.6	21,556	34.6	21,556	14.2	12,024
Lincoln	28.1	2,164	17.6	1,355	31.0	2,387	9.8	755	13.5	1,040
Linn	22.6	4,543	15.0	3,015	36.5	7,337	11.9	2,392	14.0	2,814
Marion	26.8	11,792	15.6	6,864	28.6	12,584	12.5	5,500	16.5	7,260
Multnomah	21.3	41,727	13.2	25,859	27.9	54,656	15.3	29,973	22.3	43,686
Polk	25.6	2,662	17.4	1,810	30.7	3,193	12.0	1,248	14.3	1,487
Tillamook	24.7	1,235	16.1	805	34.4	1,720	10.4	520	14.4	720
Washington	15.9	6,265	12.1	4,767	27.9	10,993	16.5	6,501	27.6	10,874
Yamhill	29.2	3,387	17.8	2,065	29.8	3,457	10.9	1,264	12.3	1,427
W. Oregon	21.6	120,961	14.2	79,542	30.6	171,253	14.0	78,425	19.6	109,224
County Aggregations Approximating BLM Districts:										
Salem	22.0	90,580	14.0	57,666	29.4	121,086	14.3	58,665	20.3	83,506
Eugene	17.7	11,027	14.2	8,847	34.6	21,556	14.2	8,847	19.3	12,024
Roseburg	19.7	4,433	15.1	3,398	35.5	7,988	13.7	3,082	16.0	3,600
Medford	25.4	10,678	15.9	6,695	31.8	13,399	11.8	4,954	15.1	6,374
Coos Bay	20.2	4,243	14.0	2,936	34.4	7,224	13.7	2,877	17.7	3,720

Appendix C: Table 11 Continued
Earnings

	17	18	19	20	21	22	23	24
	Personal Income by Major Sources, 1961 (\$ Millions)							
	Total	As % of W. Ore.	Wage & Salary Disburse- ments	Other Labor	Prop- rieter's Income	Property Income	Transfer Payments	Less: Pers. Contrib. for Soc. Insur.
Benton	67.04	1.93	43.26	2.49	8.58	10.37	4.14	1.80
Clackamas	162.83	4.68	95.23	3.77	21.40	28.09	18.33	3.99
Clatsop	57.13	1.64	34.25	1.52	8.60	7.83	6.37	1.44
Columbia	32.43	0.93	18.04	0.79	5.28	4.62	4.46	0.76
Coos	111.00	3.19	70.72	3.04	15.39	14.88	9.93	2.96
Curry	27.28	0.78	16.88	1.03	4.25	3.52	2.30	0.70
Douglas	124.61	3.58	82.63	4.02	13.22	15.72	12.48	3.46
Jackson	147.68	4.25	89.59	3.69	22.82	20.24	15.09	3.75
Josephine	51.89	1.49	29.23	1.23	7.39	7.93	7.33	1.22
Lane	345.52	9.93	229.24	9.63	45.41	42.34	28.48	9.58
Lincoln	42.93	1.23	24.79	1.06	6.12	6.33	5.67	1.04
Linn	113.51	3.26	73.18	2.93	16.27	13.59	10.60	3.06
Marion	259.79	7.47	166.72	6.59	34.58	34.15	24.72	6.97
Multnomah	1,668.10	47.96	1,134.85	39.15	205.53	208.45	127.56	47.44
Polk	36.88	1.06	24.10	0.98	4.59	4.27	3.94	1.00
Tillamook	35.58	1.02	20.77	0.98	6.60	4.73	3.36	0.86
Washington	141.29	4.06	83.52	2.90	19.85	24.82	13.69	3.49
Yamhill	52.81	1.52	28.78	1.23	9.18	7.76	7.06	1.20
W. Oregon	3,478.30	100.00	2,265.78	87.03	455.06	459.64	305.51	94.72
County Aggregations Approximating BLM Districts:								
Salem	2,670.32	76.77	1,747.49	64.39	346.58	355.01	229.90	73.05
Eugene	345.52	9.93	229.24	9.63	45.41	42.34	28.48	9.58
Roseburg	124.61	3.58	82.63	4.02	13.22	15.72	12.48	3.46
Medford	199.57	5.73	118.82	4.92	30.21	28.17	22.42	4.97
Coos Bay	138.28	3.98	87.60	4.07	19.64	18.40	12.23	3.66

Appendix C: Table 11 Continued
Earnings

	25	26	27	28	29	30	31	32	33	34	35
	Percent of Total Personal Income by Source of Income 1961										
	Farm Wages and Farm Pro- priet- ors	Con- tract and Const.	Mfg.	Whsle. Retail & Trade	Fin- ance & Real Es- tate	Trans- port	Ser- vices	Government Fed. Civil	State Local	Prop- erty	Trans- fer Pay- ments
Benton	0.69	4.12	15.83	8.37	2.54	1.30	7.22	3.91	15.45	15.47	6.18
Clackamas	2.78	3.70	19.51	12.31	0.95	2.73	5.05	2.00	8.97	17.25	11.26
Clatsop	0.75	2.15	21.42	8.54	1.05	2.66	4.08	3.87	7.18	13.71	11.15
Columbia	5.92	1.08	32.04	5.33	0.93	2.13	1.63	2.93	5.61	14.25	13.76
Coos	1.74	2.83	29.34	9.65	1.20	4.12	5.11	11.89	6.26	13.41	8.95
Curry	5.13	1.91	36.99	6.52	0.92	1.28	2.20	0.44	8.36	12.90	8.43
Douglas	0.18	2.99	33.71	8.30	1.16	1.37	3.54	4.17	7.54	12.62	10.02
Jackson	2.57	3.15	18.47	12.55	1.31	2.19	5.52	3.47	7.87	13.71	10.22
Josephine	1.60	1.46	19.31	9.50	1.54	1.50	5.92	2.99	9.58	15.28	14.13
Lane	0.86	5.59	25.32	11.48	1.14	4.08	5.65	1.75	8.25	12.25	8.24
Lincoln	0.35	1.77	27.14	7.45	0.93	1.79	3.75	0.56	11.11	14.74	13.21
Linn	5.47	2.21	31.98	8.92	1.05	2.48	3.39	2.16	7.61	11.97	9.34
Marion	4.36	4.03	10.68	10.16	3.28	1.46	5.15	1.64	22.88	13.15	9.52
Multnomah	0.19	4.05	14.33	17.15	4.35	5.78	8.18	4.19	5.63	12.50	7.65
Polk	5.69	2.33	34.19	7.81	0.68	1.68	2.63	0.87	8.62	11.58	10.68
Tillamook	5.14	1.07	27.74	6.77	0.79	3.09	3.06	0.76	9.39	13.29	9.44
Washington	4.61	4.32	25.57	8.73	1.14	3.18	4.30	0.47	7.52	17.57	9.69
Yamhill	6.82	1.87	18.54	8.35	2.39	1.50	6.31	0.70	8.52	14.69	13.37
W. Oregon	1.41	3.80	18.91	13.57	2.87	4.11	6.44	3.07	8.14	13.21	8.78
County Aggregations Approximating BLM Districts:											
Salem	1.43	3.74	16.78	14.46	3.38	4.43	6.84	3.28	8.21	13.29	8.61
Eugene	0.86	5.59	25.32	11.48	1.14	4.08	5.65	1.75	8.25	12.25	8.24
Roseburg	0.18	2.99	33.71	8.30	1.16	1.37	3.54	4.17	7.54	12.62	10.02
Medford	2.31	2.71	18.89	11.76	1.37	2.01	5.62	3.34	8.31	14.12	11.23
Coos Bay	2.41	2.65	30.85	9.03	1.14	3.56	4.53	1.04	6.67	13.31	8.84

Appendix C: Table 11 Continued
Earnings

	36	37	38	39	40	41
	Personal Income Tax Data, 1964				1964	1964
	No. of Returns	No. of Exemptions	Income Reported	State Tax	Area Income as % of W. Ore.	Income per Capita
Benton	13,406	36,760	85,584,214	2,652,445	2.5	1,874
Clackamas	41,038	117,091	284,416,353	8,629,901	8.3	2,256
Clatsop	8,738	22,437	51,352,482	1,581,349	1.5	2,141
Columbia	6,983	20,637	40,751,857	1,093,974	1.2	1,683
Coos	17,060	49,999	104,298,433	2,895,542	3.1	1,964
Curry	4,405	12,626	26,384,913	761,772	0.8	1,989
Douglas	21,809	64,874	132,039,847	3,609,365	3.9	1,880
Jackson	26,340	74,214	160,690,572	4,539,944	4.7	1,837
Josephine	9,839	28,051	54,783,975	1,469,575	1.6	1,578
Lane	60,820	174,017	399,013,532	11,742,588	11.7	2,099
Lincoln	7,790	21,150	41,796,801	1,163,750	1.2	1,864
Linn	20,437	59,502	114,483,864	3,006,719	3.3	1,788
Marion	43,683	116,129	247,778,228	6,958,014	7.2	1,779
Multnomah	192,677	482,189	1,302,152,411	41,581,023	38.1	2,405
Polk	8,653	23,859	47,489,603	1,276,861	1.4	1,439
Tillamook	5,114	14,488	26,932,484	709,980	0.8	1,664
Washington	34,730	101,223	243,493,986	7,294,426	7.1	2,169
Yamhill	10,832	29,451	55,426,929	1,483,742	1.6	1,480
W. Oregon	534,354	1,448,696	3,418,870,484	102,450,970	100.0	2,091
County Aggregations Approximating BLM Districts:						
Salem	394,081	1,044,916	2,541,659,212	77,432,184	74.2	2,143
Eugene	60,820	174,017	399,013,532	11,742,588	11.7	2,099
Roseburg	21,809	64,874	132,039,847	3,609,365	3.9	1,880
Medford	36,179	102,265	215,474,547	6,009,519	6.3	1,763
Coos Bay	21,465	62,624	130,683,346	3,657,314	3.9	1,969

Sources for Data on Earnings

Column
Number

- 1- 4 "Survey of Buying Power," Sales Management, June 10, 1968, p. 172-174.
- 5 U.S. Bureau of the Census, City and County Data Book, 1967 (Washington, D.C.: Government Printing Office, 1968), p.304.
- 6 Calculations by author based on column 5, this table, and column 4, Table 8.
- 7-16 "Survey of Buying Power," op. cit.
- 17 U.S. Bonneville Power Administration. Pacific Northwest Economic Base Study for Power Markets (vol. 2, pt. 4: Personal Income; Portland, Ore.: 1964), Oregon tables 1-37.
- 18 Calculations by author based on column 17.
- 19-24 U.S. Bonneville Power Administration, op. cit.
- 25-35 Calculations by author based on data contained in U.S. Bonneville Power Administration, op. cit.
- 36-39 Oregon. State Tax Commission. Research and Planning Section, Analysis of Oregon's Personal Income Tax Returns for the Tax Year 1964 (Salem: 1966), p.28-42.
- 40 Calculations by author based on column 38.
- 41 Calculations by author based on column 38, this table, and column 4, Table 8.

Appendix C: Table 12
Government

	1	2	3	4	5	6
	General Revenues, 1962		% Total Taxes	Total General Expenditures	Assessed Valuation of Property 1967-68	
	Total (\$1000)	% Inter- govern- mental Net			Total	Per Capita
Benton	6,958	34.7	49.7	7,567	71,699,593	1,525
Clackamas	22,285	33.9	55.1	23,314	255,516,387	1,799
Clatsop	5,656	25.1	48.5	6,342	59,489,042	2,140
Columbia	4,891	31.5	51.7	4,727	46,324,274	1,853
Coos	11,528	35.0	53.4	11,253	98,456,846	1,886
Curry	3,490	45.1	42.7	3,723	29,609,601	2,369
Douglas	17,879	48.8	39.2	18,131	161,790,823	2,157
Jackson	16,164	43.2	43.3	16,217	162,747,517	1,713
Josephine	7,314	49.7	31.2	7,610	57,191,916	1,567
Lane	38,299	37.3	46.7	39,286	365,444,918	1,791
Lincoln	5,358	34.6	52.1	5,289	62,838,178	2,668
Linn	12,082	37.4	52.1	12,765	146,329,246	2,184
Marion	17,537	33.4	52.4	18,766	226,463,570	1,515
Multnomah	122,631	19.4	61.5	118,387	952,546,522	1,714
Polk	4,095	37.9	51.0	3,895	54,150,393	1,607
Tillamook	4,428	31.2	39.6	5,000	32,840,150	2,053
Washington	17,681	31.1	57.0	18,377	231,903,422	1,812
Yamhill	6,365	36.4	48.8	6,487	52,227,184	1,275
W. Oregon	324,641	30.5	53.5	327,136	3,067,569,582	1,772
County Aggregations Approximating ELM Districts:						
Salem	229,967	26.0	57.3	230,916	2,192,327,961	1,745
Eugene	38,299	37.3	46.7	39,286	365,444,918	1,791
Roseburg	17,879	48.8	39.2	18,131	161,790,823	2,157
Medford	23,478	45.2	39.5	23,827	219,939,433	1,673
Coos Bay	15,018	37.3	50.9	14,976	128,066,447	1,979

Appendix C: Table 12 Continued
Government

	7	8	9	10
	Allocation of BLM Receipts to Counties from Revested Oregon and California and Reconveyed Coos Bay Wagon Road Land-Grant Funds: June 8, 1916 to June 30, 1967.			
	1916-1961	1962-1967 Total	1962-1967 Average	% of W. Ore.
Benton	4,341,596	3,177,758	529,626	2.80
Clackamas	7,959,101	6,196,134	1,032,689	5.46
Clatsop	0	0	0	0.00
Columbia	2,355,979	2,817,275	469,546	2.80
Coos	10,048,954	8,269,591	1,378,265	7.29
Curry	3,199,041	4,761,984	793,664	4.20
Douglas	35,907,512	28,645,342	4,774,224	25.25
Jackson	22,914,520	17,821,845	2,970,308	15.71
Josephine	15,076,748	13,806,244	2,301,041	12.17
Lane	21,801,872	17,217,379	2,869,563	15.17
Lincoln	571,189	409,666	68,278	0.36
Linn	4,032,390	2,984,304	497,384	2.63
Marion	2,205,338	1,641,514	273,585	1.45
Multnomah	2,084,299	1,119,586	186,598	0.99
Polk	3,355,820	2,428,085	404,681	2.14
Tillamook	879,795	627,303	104,551	0.55
Washington	974,806	700,386	116,731	0.62
Yamhill	1,090,191	819,329	136,555	0.72
W. Oregon	138,799,151	113,453,775	18,908,962	100.00
County Aggregations Approximating BLM Districts:				
Salem	29,850,504	22,931,340	3,821,890	20.21
Eugene	21,801,872	17,217,379	2,869,563	15.17
Roseburg	35,907,512	28,645,342	4,774,224	25.25
Medford	37,991,268	31,628,089	5,271,348	27.88
Coos Bay	13,247,995	13,031,625	2,171,937	11.49

Appendix C: Table 12 Continued
Government

	11	12	13	14	15
	County Government Revenues, 1962 (\$1000s)				
	General Revenue*	Intergovernmental Revenue			Local Taxes
		Total	From BLM	From Forest Service, State and Other	
Benton	1,114	894	436	458	220
Clackamas	4,535	2,661	878	1,783	1,874
Clatsop	743	220	0	220	523
Columbia	1,103	440	242	198	663
Coos	2,565	1,572	959	613	1,093
Curry	1,343	989	465	524	374
Douglas	6,969	5,640	3,904	1,736	1,329
Jackson	4,119	3,720	2,415	1,305	399
Josephine	3,339	2,215	1,851	264	1,124
Lane	8,670	6,300	2,376	3,924	2,370
Lincoln	1,407	759	55	704	648
Linn	2,861	1,770	409	1,361	1,091
Marion	4,086	1,705	228	1,477	2,081
Multnomah	25,889	5,558	269	5,289	20,331
Polk	1,108	541	336	205	567
Tillamook	2,037	562	88	474	1,475
Washington	2,401	884	100	784	1,517
Yamhill	1,319	478	111	367	841
W. Oregon	75,608	36,908	15,122	21,686	38,700
County Aggregations Approximating BLM Districts:					
Salem	48,603	16,472	3,152	13,320	32,131
Eugene	8,670	6,300	2,376	3,924	2,370
Roseburg	6,969	5,640	3,904	1,736	1,329
Medford	7,458	5,935	4,266	1,569	1,523
Coos Bay	3,908	2,561	1,424	1,137	1,347

* Excluding interlocal revenues.

Appendix C: Table 12 Continued
Government

	16	17	18	19	20	21
	BLM Contributions as % of		County Revenue Per Capita	BLM Contri- bution to County Revenue Per Capita	BLM Contri- bution to County Revenue in \$/Acre BLM Land	Per Capita BLM as % of Per Capita County Revenue
	Total County Revenue	Local Revenue				
Benton	39.14	198.0	25.91	9.91	7.80	38
Clackamas	19.36	46.8	37.36	7.23	14.65	19
Clatsop	0.00	0.0	28.25	0.00	0.00	0
Columbia	21.94	36.5	48.81	10.65	21.82	22
Coos	37.39	87.5	47.50	17.76	5.74	37
Curry	34.62	124.2	98.03	33.95	6.88	35
Douglas	56.02	293.0	98.85	55.37	5.98	56
Jackson	58.63	605.0	51.17	30.00	5.62	59
Josephine	55.44	164.5	108.06	59.91	5.96	54
Lane	27.40	100.1	48.01	13.16	8.21	27
Lincoln	3.91	8.5	55.18	2.17	2.27	4
Linn	14.30	37.3	47.52	6.80	4.64	15
Marion	5.58	11.0	31.26	17.44	11.00	56
Multnomah	1.04	1.3	48.20	0.50	53.33	1
Polk	30.32	59.3	41.65	12.62	8.16	30
Tillamook	4.32	6.0	116.40	5.02	1.74	4
Washington	4.16	6.6	22.65	0.94	8.30	4
Yamhill	8.42	13.2	37.69	3.17	2.57	8
W. Oregon	20.00	39.2	49.30	8.37	1.00	17
County Aggregations Approximating BLM Districts:						
Salem	6.49	9.8	42.08	2.73	7.62	6
Eugene	27.40	100.1	48.01	13.16	8.21	27
Roseburg	56.02	293.0	98.85	55.37	5.98	56
Medford	57.20	280.0	66.95	38.29	5.76	57
Coos Bay	36.44	105.9	57.73	21.04	6.07	36

Sources for Data on GovernmentColumn
Number

- 1- 4 U.S. Bureau of the Census, County and City Data Book, 1967
(Washington, D.C.: Government Printing Office, 1968), p.305.
- 5 Oregon Economic Statistics, 1968 (Eugene: Bureau of Business and
Economic Research, University of Oregon, 1968), p.34.
- 6 Calculations by author based on column 5, this table, and column
5, Table 8 .
- 7 U.S. Bureau of Land Management, Public Land Statistics (Annual;
Washington, D.C.: Government Printing Office), 1963: p.186.
- 8 Calculations by author based on: U.S. Bureau of Land Management,
Public Land Statistics, op. cit., 1963: p.186; 1965: p.188;
1967: p.185.
- 9-10 Calculations by author based on column 8.
- 11-12 U.S. Bureau of the Census, Census of Governments, 1962 (Vol. 4:
Compendium of Government Finances: Government in Oregon;
Washington, D.C.: Government Printing Office, 1963), p.44-45.
- 13 U.S. Bureau of Land Management, Public Land Statistics, op. cit.,
1963: p.186.
- 14 Calculations by author based on columns 12 and 13.
- 15 U.S. Bureau of the Census, Census of Governments, 1962, op. cit.
- 16 Calculations by author based on columns 11 and 14.
- 17 Calculations by author based on columns 13 and 15.
- 18 Calculations by author based on column 1, this table, and column 3,
Table 8.
- 19 Calculations by author based on column 13, this table, and column 3,
Table 8.
- 20 Calculations by author based on column 13, this table, and column 4,
Table 19.
- 21 Calculations by author based on columns 19 and 20.

Appendix C: Table 13
Banking

	1	2	3	4	5	6	7
	Time Bank Deposits and Savings Capital of Savings & Loan Associations 1964		Bank Debits* 1964		Bank Debits* 1963-1967		
	Total	Per Capita	Total (\$1000s)	Per Capita	1963 (\$1000s)	1967 (\$1000s)	% Change
Benton	32,536	712	408,620	8,948	352,063	551,626	56.6
Clackamas	59,982	476	660,937	5,244	610,071	972,382	59.4
Clatsop	31,967	1,333	237,439	9,900	223,387	325,708	45.8
Columbia	12,169	503	130,558	5,392	124,376	155,958	25.4
Coos	32,234	607	483,649	9,106	454,034	515,382	13.5
Curry	5,709	430	140,491	10,589	126,858	127,478	0.5
Douglas	40,056	570	695,112	9,895	617,358	764,596	23.8
Jackson	68,927	788	983,676	11,245	898,550	1,093,708	21.7
Josephine	33,249	958	294,516	8,483	273,083	323,797	18.6
Lane	73,922	389	2,298,305	12,092	1,990,150	2,754,088	38.4
Lincoln	10,747	479	125,452	5,594	125,987	148,383	17.8
Linn	49,208	769	588,140	9,185	540,675	698,746	29.2
Marion	136,742	982	2,599,006	18,657	2,661,620	3,185,859	19.7
Multnomah	1,005,311	1,857	17,792,452	32,865	16,657,915	23,178,484	39.1
Polk	11,892	360	89,907	2,724	83,932	113,173	34.8
Tillamook	12,514	773	137,572	8,500	126,919	158,761	25.1
Washington	73,487	655	856,624	632	776,543	1,224,863	57.7
Yamhill	27,799	742	295,931	7,902	284,662	358,862	26.1
W. Oregon	1,718,451	1,051	28,818,379	17,628	29,414,597	39,867,812	35.5
County Aggregations Approximating BLM Districts:							
Salem	1,464,354	1,235	23,922,630	20,172	22,568,151	31,072,805	37.7
Eugene	73,922	389	2,298,305	12,092	1,990,150	2,754,088	38.4
Roseburg	40,056	570	695,112	9,895	617,358	764,596	23.8
Medford	102,176	836	1,278,192	10,461	1,171,633	1,417,505	21.0
Coos Bay	37,943	572	624,140	9,402	580,892	642,860	10.7

* Bank debits represent the dollar volume of checks drawn against deposit accounts of individuals and business firms and state and local governments.

Sources for Banking Data

Column
Number

- 1 U.S. Bureau of the Census, County and City Data Book, 1967
(Washington, D.C.: Government Printing Office, 1968),
p.304.
- 2 Calculations by author based on column 1, this table, and
column 4, Table 8.
- 3 Oregon Economic Statistics, 1968 (Eugene: Bureau of Business
and Economic Research, University of Oregon, 1968), p.46.
- 4 Calculations by author based on column 3, this table, and
column 4, Table 8.
- 5-6 Oregon Economic Statistics, op. cit.
- 7 Calculations by author based on columns 5 and 6.

Appendix C: Table 14
Retail Trade

	1	2	3	4	5	6	7
	Total Retail Sales 1954, 1963						
	1954		1963		% Change 1954-63		
	County (\$1000s)	Cities* (\$1000s)	County (\$1000s)	Cities* (\$1000s)	County	Cities*	Rest
Benton	28,068	23,963	49,185	44,401	75.2	85.3	16.5
Clackamas	64,492	37,064	122,227	67,724	89.5	182.7	98.7
Clatsop	31,800	20,732	38,185	22,303	20.1	7.6	43.5
Columbia	17,234	7,841	20,833	10,390	20.9	32.5	11.2
Coos	59,182	34,910	74,660	47,498	26.2	36.0	11.9
Curry	9,492	---	16,911	---	78.2	---	78.2
Douglas	71,366	35,197	82,586	40,871	15.7	16.1	15.3
Jackson	75,443	59,637	120,645	91,664	59.9	56.4	83.3
Josephine	34,705	26,345	48,586	42,717	40.0	62.1	29.8
Lane	163,915	114,289	267,049	207,705	62.9	81.5	19.6
Lincoln	25,563	7,726	31,833	13,833	24.5	72.5	3.7
Linn	55,376	38,999	78,056	57,436	41.0	47.1	25.9
Marion	116,760	87,168	191,262	133,897	63.8	53.6	93.9
Multnomah	707,489	658,254	912,442	751,823	29.0	14.2	226.2
Polk	17,507	7,211	23,799	8,767	35.9	21.6	46.0
Tillamook	19,650	---	19,995	---	1.8	---	1.8
Washington	58,483	34,844	138,617	44,455	137.0	27.4	298.3
Yamhill	32,625	14,938	40,659	21,693	24.6	45.2	7.2
W. Oregon	1,589,150	1,209,118	2,277,530	1,606,673	43.3	32.9	76.5
County Aggregations Approximating BLM Districts:							
Salem	1,175,047	938,740	1,667,093	1,176,217	41.9	25.3	107.7
Eugene	163,915	114,289	267,049	207,705	62.9	81.7	19.6
Roseburg	71,366	35,197	82,586	40,871	15.7	16.1	15.3
Medford	110,148	85,982	169,231	134,382	53.6	56.3	44.2
Coos Bay	68,674	34,910	91,571	47,498	33.3	360.5	30.5

* Over 5000 inhabitants in 1960.

Appendix C: Table 14 Continued
Retail Trade

	8	9	10	11	12	13	14
	Retail Sales 1963						
	% in Cities of 5000+ in Area	Total (\$1000s)	General Merchan- dise Sales (\$1000s)	Retail Food Sales (\$1000s)	Auto Dealer Sales (\$1000s)	Eating & Drinking Places Sales (\$1000s)	No. of Estab- lish- ments
Benton	90.3	49,185	3,884	12,035	12,171	2,680	292
Clackamas	55.4	122,227	7,279	34,067	35,980	7,787	875
Clatsop	58.4	38,185	1,808	10,920	6,440	3,872	364
Columbia	49.9	20,833	943	7,096	4,786	1,608	211
Coos	63.6	74,660	5,668	19,661	16,704	4,826	532
Curry	---	16,911	679	5,376	3,597	1,520	161
Douglas	49.5	82,586	7,077	19,311	18,962	5,427	677
Jackson	76.0	120,645	10,236	28,736	25,049	7,800	762
Josephine	87.9	48,586	3,672	12,873	10,981	2,696	385
Lane	77.8	267,049	29,299	60,819	63,162	16,844	1,468
Lincoln	41.9	31,833	1,484	9,692	5,724	4,147	388
Linn	73.6	78,056	5,650	21,303	14,830	4,388	624
Marion	69.9	191,262	29,586	39,345	40,011	11,081	1,185
Multnomah	82.4	912,442	191,616	167,811	174,182	79,014	4,492
Polk	36.8	23,799	1,395	6,603	4,369	1,815	217
Tillamook	---	19,995	535	5,958	3,291	1,874	238
Washington	32.1	138,617	12,211	32,647	38,363	8,424	827
Yamhill	53.4	40,659	2,391	8,896	11,748	2,022	385
W. Oregon	70.5	2,277,530	315,413	503,149	479,396	167,825	14,083
County Aggregations Approximating BLM Districts:							
Salem	70.6	1,667,093	258,782	356,373	340,941	128,712	10,098
Eugene	77.8	267,049	29,299	60,819	63,162	16,844	1,468
Roseburg	49.5	82,586	7,077	19,311	18,962	5,427	677
Medford	79.4	169,231	13,908	41,609	36,030	10,496	1,147
Coos Bay	51.9	91,571	6,347	25,037	20,301	6,346	693

Appendix C: Table 14 Continued
Retail Trade

	15	16	17	18	19	20
	Retail Sales Per Capita 1963					1963
	Total	General Merchan- dise Sales	Retail Food Sales	Auto Dealer Sales	Eating & Drinking Places Sales	Retail Sales per Estab- lishment (\$1000)
Benton	1,118	88	274	277	61	168.4
Clackamas	1,007	60	281	296	64	139.7
Clatsop	1,452	69	415	245	147	104.9
Columbia	918	42	313	211	71	98.7
Coos	1,383	105	364	309	89	140.3
Curry	1,234	50	392	263	111	105.0
Douglas	1,171	100	274	269	77	122.0
Jackson	1,499	127	357	311	97	158.3
Josephine	1,572	119	417	355	87	126.2
Lane	1,479	162	337	350	93	181.9
Lincoln	1,248	58	380	224	162	82.0
Linn	1,297	94	354	246	73	125.1
Marion	1,463	226	301	306	85	161.4
Multnomah	1,699	357	312	324	147	203.1
Polk	832	49	231	153	63	109.7
Tillamook	1,143	31	340	188	107	84.0
Washington	1,308	115	308	362	79	167.6
Yamhill	1,162	68	254	336	58	105.6
W. Oregon	1,437	199	317	302	106	161.7
County Aggregations Approximating ELM Districts:						
Salem	1,443	224	309	295	111	165.1
Eugene	1,479	162	337	295	93	181.9
Roseburg	1,171	100	274	269	77	122.0
Medford	1,519	125	374	323	94	147.5
Coos Bay	1,353	94	370	300	94	132.1

Sources for Retail Trade DataColumn
Number

- 1- 4 Oregon Economic Statistics, 1968 (Eugene; Bureau of Business and Economic Research, University of Oregon, 1968), p.79-80.
- 5 Calculations by author based on columns 1 and 3.
- 6 Calculations by author based on columns 2 and 4.
- 7 Calculations by author based on columns 1 through 4.
- 8 Calculations by author based on data contained in: Oregon Economic Statistics, 1968, op. cit.
- 9-12 U.S. Bureau of the Census, County and City Data Book, 1967 (Washington D.C.: Government Printing Office, 1968), p.308.
- 13 U.S. Bureau of the Census, 1963 Census of Business (Vol.2, Retail Trade: pt.39, Oregon; Washington, D.C.: Government Printing Office, 1964), p.8-11.
- 14 U.S. Bureau of the Census, County and City Data Book, 1967, op. cit.
- 15 Calculations by author based on column 9, this table, and column 3, Table 8.
- 16 Calculations by author based on column 10, this table, and column 3, Table 8.
- 17 Calculations by author based on column 11, this table, and column 3, Table 8.
- 18 Calculations by author based on column 12, this table, and column 3, Table 8.
- 19 Calculations by author based on column 13, this table, and column 3, Table 8.
- 20 Calculations by author based on columns 9 and 14.

Appendix C: Table 15
Wholesale Trade

	1	2	3	4	5	6	7	8	9	10
	No. of Establishments			Wholesale Sales						
				Total (\$1000s)			Per Establishment (\$1000s)			\$ Per Capita 1963
	1954	1963	% Change	1954	1963	% Change	1954	1963	% Change	
Benton	29	45	55.2	13,168	21,431	62.8	454.1	476.2	4.9	487
Clackamas	52	126	142.3	28,328	181,748	541.6	544.8	1,442.4	164.8	1,497
Clatsop	54	43	-20.4	11,047	10,130	-8.3	204.6	235.6	15.2	385
Columbia	21	32	52.4	3,636	5,277	45.1	173.1	164.9	-4.7	232
Coos	73	96	31.5	43,960	58,120	32.2	602.2	605.4	0.5	1,076
Curry	8	21	162.5	1,768	9,844	456.8	221.0	468.8	112.1	718
Douglas	82	90	9.8	34,268	42,031	22.7	417.9	467.0	11.7	596
Jackson	115	164	42.6	81,415	126,651	55.6	708.0	772.3	9.1	1,573
Josephine	34	38	11.8	17,546	17,043	-2.9	516.1	448.5	-13.1	552
Lane	210	295	40.5	164,824	145,909	49.2	784.9	833.6	6.2	1,362
Lincoln	33	39	18.2	8,069	9,228	14.4	244.5	236.6	-3.2	362
Linn	74	82	10.8	25,936	57,712	122.5	305.5	703.8	100.8	959
Marion	146	181	24.0	57,849	101,620	75.7	396.2	561.4	41.7	778
Multnomah	1,414	1,707	20.7	1,694,490	3,111,488	83.6	1,198.4	1,822.8	52.1	5,793
Polk	36	37	2.8	29,134	16,140	-44.6	809.3	436.2	-46.1	564
Tillamook	28	27	-3.6	11,525	13,686	18.8	411.6	506.9	23.2	782
Washington	50	118	136.0	19,460	115,200	492.0	389.2	976.3	150.8	1,087
Yamhill	42	44	4.8	18,060	18,972	5.0	430.0	431.2	0.3	542
W. Oregon	2,501	3,185	27.3	2,264,483	4,162,230	83.8	905.4	1,306.8	44.3	2,626
County Aggregations Approximating BLM Districts:										
Salem	1,979	2,481	25.4	1,920,702	3,662,632	91.0	970.5	1,476.3	52.1	3,171
Eugene	210	295	40.5	164,824	245,909	49.2	784.9	833.6	6.2	1,362
Roseburg	82	90	9.8	34,268	42,031	22.7	417.9	467.0	11.7	596
Medford	149	202	35.6	98,961	143,694	45.2	664.2	711.4	7.1	1,290
Coos Bay	81	117	44.4	45,728	67,964	48.6	564.5	580.9	2.9	1,004

Sources for Wholesale Trade Data

Column
Number

- 1-2 Oregon Economic Statistics, 1968. (Eugene: Bureau of Business and Economic Research, University of Oregon, 1968), p.81.
- 3 Calculations by author based on columns 1 and 2.
- 4-5 Oregon Economic Statistics, 1968, op. cit.
- 6 Calculations by author based on columns 4 and 5.
- 7 Calculations by author based on columns 1 and 4.
- 8 Calculations by author based on columns 2 and 5.
- 9 Calculations by author based on columns 7 and 8.
- 10 Calculations by author based on column 5, this table, and column 3, Table 8.

Appendix C: Table 16
Selected Services

	1	2	3	4	5	6	7	8
	1963						Receipts	%
	Establishments		Receipts		Paid	Payroll	1958	Change
	Total	With Payroll	Total (\$1000s)	Per Capita \$	Employees	Entire Year (\$1000s)	(\$1000s)	1958-63
Benton	192	110	5,716	129.9	516	1,671	3,469	64.8
Clackamas	502	234	10,630	87.6	835	2,767	6,711	58.4
Clatsop	235	99	5,580	212.2	355	1,134	4,561	22.3
Columbia	94	42	1,108	48.8	69	153	1,129	-1.9
Coos	296	144	8,833	163.5	615	2,437	6,620	33.4
Curry	109	51	2,220	162.0	104	300	1,425	55.8
Douglas	414	174	9,004	127.7	563	1,975	5,944	51.5
Jackson	535	243	13,212	164.1	1,004	3,030	9,280	42.4
Josephine	269	107	5,136	166.2	323	1,070	3,770	36.2
Lane	1,073	517	32,426	179.5	2,506	8,984	19,666	64.9
Lincoln	268	114	4,533	177.8	321	872	3,518	28.9
Linn	286	144	5,518	91.7	408	1,168	4,702	17.4
Marion	640	318	19,411	148.5	1,612	5,482	13,501	43.8
Multnomah	3,567	1,921	185,777	345.9	14,199	52,491	148,341	25.2
Polk	112	50	1,859	65.0	124	331	1,426	30.4
Tillamook	117	51	1,915	109.4	108	305	1,860	30.1
Washington	498	244	10,816	102.0	998	2,767	5,487	97.1
Yamhill	161	85	3,069	87.7	253	664	2,126	44.4
W. Oregon	9,368	4,648	326,763	206.1	24,913	87,601	243,536	34.2
County Aggregations Approximating BLM Districts:								
Salem	6,672	3,412	255,932	221.6	19,798	69,805	196,831	30.0
Eugene	1,073	517	32,426	179.6	2,506	8,984	19,666	64.9
Roseburg	414	174	9,004	127.7	563	1,975	5,944	51.5
Medford	804	350	18,348	164.7	1,327	4,100	13,050	40.6
Coos Bay	405	195	11,053	163.3	719	2,737	8,045	37.4

Sources for Selected Services Data

Column
Number

- 1-3 U.S. Bureau of the Census, County and City Data Book, 1967
(Washington: Government Printing Office, 1968), p.309.
- 4 Calculations by author based on column 3, this table, and column 3, Table 8.
- 5-7 U.S. Bureau of the Census, County and City Data Book, 1967, op. cit.
- 8 Calculations by author based on columns ³~~4~~ and 7.

Appendix C: Table 17
Agriculture, 1964

	1	2	3		4	5	6
	All Farms	Total Acreage (1000s)	Value of Farm Products Sold			Total Income	
			Total (\$1000s)	Crops (\$1000s)	Livestock (\$1000s)	From Sources Other Than Farm Operated (\$1000s)	
Benton	858	208	6,138	3,705	2,416		4,938
Clackamas	4,116	262	26,911	13,117	13,776		22,374
Clatsop	486	40	2,994	227	2,765		2,645
Columbia	1,149	95	4,245	1,182	3,017		5,496
Coos	1,058	249	5,644	949	4,692		5,243
Curry	262	110	1,899	672	1,226		1,474
Douglas	1,922	528	6,028	1,841	4,185		9,586
Jackson	1,556	643	12,845	6,930	5,907		7,317
Josephine	823	76	4,213	1,333	2,862		3,933
Lane	2,893	416	16,795	9,182	7,588		15,340
Lincoln	504	68	1,108	210	889		2,359
Linn	2,434	467	22,387	15,259	7,102		10,892
Marion	3,388	334	43,707	32,403	11,290		16,031
Multnomah	918	67	11,876	9,086	2,758		4,934
Polk	1,235	215	10,525	7,180	3,340		6,209
Tillamook	716	66	7,214	142	7,072		2,487
Washington	2,468	200	20,673	13,181	7,476		13,112
Yamhill	2,056	255	17,704	10,253	7,420		10,060
W. Oregon	28,843	4,299	1,953,399	126,852	95,781		144,430
County Aggregations Approximating BLM Districts:							
Salem	20,328	2,277	175,482	105,945	69,321		101,537
Eugene	2,893	416	16,795	9,182	7,588		15,340
Roseburg	1,922	528	6,028	1,841	4,185		9,586
Medford	2,379	719	17,058	8,263	8,769		11,250
Coos Bay	1,321	359	7,543	1,621	5,918		6,717

Appendix C: Table 17 Continued
Agriculture, 1964

	7	8	9	10	11	12	13
	Commercial* Farms						
	Total Number	% of All Land	Acres	Working Off Total	100 Days +	Value of All Farm Products Sold (\$)	Any Specified Farm Expend- itures (\$)
Benton	360	36.0	153,908	136	76	5,627,682	2,416,481
Clackamas	1,631	13.5	164,286	695	402	25,187,784	13,343,966
Clatsop	208	48.9	25,590	64	35	2,850,955	1,662,425
Columbia	403	14.4	59,087	172	97	3,876,479	1,617,470
Coos	506	18.6	192,795	206	123	5,338,967	2,448,648
Curry	144	8.3	94,762	63	37	1,820,856	931,313
Douglas	748	12.0	387,112	300	150	5,871,462	2,749,565
Jackson	725	22.9	414,663	276	155	12,553,055	6,892,343
Josephine	368	4.4	45,963	126	53	3,960,649	2,083,152
Lane	1,054	10.0	292,251	403	221	15,399,041	8,354,048
Lincoln	178	5.8	36,350	78	37	965,571	547,082
Linn	1,211	26.9	394,768	509	256	21,566,363	9,065,951
Marion	2,102	38.0	285,200	930	480	41,772,377	20,362,223
Multnomah	478	15.5	41,913	164	116	11,401,227	5,387,165
Polk	680	38.6	182,452	285	138	10,140,828	4,417,623
Tillamook	502	7.7	54,496	193	113	7,092,731	3,135,273
Washington	1,255	35.0	159,879	515	316	19,721,376	8,734,580
Yamhill	1,046	44.7	203,958	449	246	16,950,845	8,070,166
W. Oregon	13,599	16.8	3,188,433	5,564	3,051	212,098,248	102,219,474
County Aggregations Approximating BLM Districts:							
Salem	10,054	22.6	1,760,887	4,190	2,312	167,154,218	78,760,405
Eugene	1,054	10.0	292,251	403	221	15,399,041	8,354,048
Roseburg	748	12.0	387,112	300	150	5,871,462	2,749,565
Medford	1,093	16.2	460,626	402	160	16,513,704	8,975,495
Coos Bay	650	13.9	287,557	269	208	7,159,823	3,379,961

* Farms with sales of \$2,500 or more, or farms on which the operator was under 65 and did not work off the farm 100 days or more.

Appendix C: Table 17 Continued
Agriculture, 1964

	14	15	16	17	18	19
	Commercial* Farms					
	Number of Farms by Economic Class				Percent	Average
	Class I \$40,000+	Class II \$20,000- 39,000	Class III \$10,000- 19,000	Class IV \$5,000- 9,000	with Sales \$10,000 and over	Value of Farm Products Sold per Farm (\$)
Benton	37	45	53	60	37.5	15,632
Clackamas	144	154	206	311	30.9	15,443
Clatsop	19	26	30	32	36.1	13,707
Columbia	17	30	59	65	26.3	9,619
Coos	15	47	115	111	35.0	10,551
Curry	8	16	29	30	36.8	12,645
Douglas	15	38	110	128	21.8	7,850
Jackson	61	69	104	133	32.3	17,315
Josephine	17	31	32	54	21.7	10,763
Lane	105	113	155	178	35.4	14,610
Lincoln	1	9	16	31	14.6	5,425
Linn	135	187	211	216	44.0	17,809
Marion	260	335	386	420	46.7	19,873
Multnomah	72	72	79	83	46.7	23,852
Polk	63	82	130	138	40.4	14,913
Tillamook	19	107	155	108	56.0	14,129
Washington	102	163	229	278	39.4	15,714
Yamhill	90	141	157	195	37.1	16,951
W. Oregon	1,180	1,665	2,256	2,571	33.5	15,597
County Aggregations Approximating BLM Districts:						
Salem	959	1,351	1,711	1,937	32.5	16,626
Eugene	105	113	155	178	35.4	14,610
Roseburg	15	38	110	128	21.8	7,850
Medford	78	100	136	187	37.3	15,109
Coos Bay	23	63	144	141	38.0	11,015

* Farms with sales of \$2,500 or more, or farms on which the operator was under 65 and did not work off the farm 100 days or more.

Sources for Agriculture Data

Column
Number

- 1-6 U.S. Bureau of the Census, County and City Data Book, 1967
(Washington, D.C.: Government Printing Office, 1968),
p.310-311.
- 7 U.S. Bureau of the Census, 1964 Census of Agriculture (Vol.1,
pt. 47, Oregon; Washington, D.C.: Government Printing
Office, 1967), p.292.
- 8 Calculations by author based on columns 2 and 9.
- 9-17 U.S. Bureau of the Census, 1964 Census of Agriculture, op. cit.,
p.292, 296.
- 18 Calculations by author based on columns 14 through 17.
- 19 Calculations by author based on columns 7 and 12.

Appendix C: Table 18
Forest Industry Capacity

	1	2	3	4	5	6
	Logging M/Day	Sawmill M/Day	Softwood Plywood 3/8" base Per Day	Plywood Veneer 3/8" base Per Day	Boards* M on 1/8" base Per Day	Pulp and Paper Products** Tons/Day
Benton	1,542	885	440	375	90	50
Clackamas	1,635	1,345	0	92	0	2,640
Clatsop	1,147	237	80	0	0	0
Columbia	3,136	860	140	0	496	3,190
Coos	2,677	1,775	703	110	370	340
Curry	1,154	290	270	0	0	0
Douglas	8,139	2,320	1,294	1,378	780	1,075
Jackson	4,402	1,235	959	878	660	0
Josephine	765	1,015	500	0	0	0
Lane	5,038	5,000	1,671	301	730	2,300
Lincoln	714	677	128	0	0	1,915
Linn	2,315	990	1,085	720	822	1,250
Marion	1,075	488	112	0	0	425
Multnomah	870	525	185	0	0	333
Polk	1,855	640	340	25	0	0
Tillamook	1,314	560	220	0	0	0
Washington	160	468	0	0	85	80
Yamhill	546	466	116	24	0	210
W. Oregon	38,484	19,776	8,243	3,903	3,948	13,808
County Aggregations Approximating BLM Districts:						
Salem	16,309	8,141	2,846	1,236	1,408	10,093
Eugene	5,038	5,000	1,671	301	730	2,300
Roseburg	8,139	2,320	1,294	1,378	780	1,075
Medford	5,167	2,250	1,459	1 878	660	0
Coos Bay	3,831	2,065	973	110	370	250

* Includes Insulation, Particle and Hardboard.

** Includes Paper, Roofing, Pulp and Corrugated Board.

Sources for Forest Industry Capacity Data

Column
Number

- 1-2 1969 Directory of the Forests Products Industry (San Francisco: Miller Freeman Publications, 1969), p.139-189.
- 3 Ibid., p.355-365.
- 4 Ibid., p.376-378.
- 5 Ibid., p.406-408, 411-412, 413-414.
- 6 Post's Pulp and Paper Directory, 1968 (San Francisco: Miller Freeman Publications, 1967), p.18, 20, 128-133.

Appendix C: Table 19
Forest Statistics

	1	2	3	4	5	6	7	8	9
	Land Area and Commercial Forest Area, 1963 (1000 Acres)								
	Commercial Forests							Commer-	BLM
	All Land	All Owner-ships	National Forest	BLM	Other Public	Forest Industry	Farmer and Misc. Private	cial Forest as % of All Land	as % of All Commercial Forest
Benton	428	280	17	56	16	15	176	65.4	20.0
Clackamas	1,208	945	418	60	*	*	*	78.2	6.3
Clatsop	525	465	0	1	143	221	100	88.6	0.4
Columbia	413	336	0	11	8	195	122	81.4	3.3
Coos	1,031	900	66	167	70	288	309	87.3	18.6
Curry	1,038	855	483	68	-5	161	149	82.4	8.0
Douglas	3,239	2,864	960	653	31	695	525	88.4	22.8
Jackson	1,802	1,365	399	430	-30	309	257	75.7	31.5
Josephine	1,040	915	359	310	18	61	167	88.0	34.0
Lane	2,918	2,363	1,179	289	-8	567	336	81.0	12.2
Lincoln	630	583	169	24	23	256	111	92.5	4.1
Linn	1,464	1,003	379	88	21	235	280	68.5	8.8
Marion	751	384	222	21	*	*	*	51.1	5.4
Multnomah	271	128	80	5	*	*	*	47.2	3.9
Polk	473	279	1	41	*	*	*	59.0	14.8
Tillamook	714	646	154	51	*	*	*	90.5	7.9
Washington	458	255	0	12	*	*	*	55.7	4.7
Yamhill	454	258	23	43	0	90	102	56.8	16.7
* Sum of Undistrib-					445	416	712		
W. Oregon	18,858	14,826	4,909	2,330	732	3,509	3,346	78.6	15.7
County Aggregations Approximating BLM Districts:									
Salem	7,790	5,563	1,463	413	656	1,428	1,603	71.4	7.4
Eugene	2,918	2,364	1,179	290	-8	567	336	81.0	12.2
Roseburg	3,239	2,864	960	653	31	695	525	88.4	22.8
Medford	2,842	2,280	758	740	12	370	424	80.2	32.5
Coos Bay	2,069	1,755	549	234	65	449	458	84.8	13.3

Appendix C: Table 19 Continued
Forest Statistics

	10	11	12	13	14	15	16	17
	Net Volume* of Sawtimber on Commercial Forest Land, 1963							
	Total	National Forest	BLM	Other Public	Forest Industry	Other Private	Public as % of Total	BLM as % of Total
Benton	7,690	885	2,070	1,527	386	2,822	58.3	19.8
Clackamas	29,636	24,640	1,507	109	1,460	1,920	88.6	5.1
Clatsop	9,272	0	22	2,450	5,200	1,600	26.7	0.2
Columbia	2,524	0	124	0	1,300	1,100	4.9	4.9
Coos	28,049	2,619	5,465	7,514	8,032	4,419	55.6	19.5
Curry	20,956	12,669	1,406	456	4,996	1,429	69.3	6.7
Douglas	94,234	40,191	18,894	7,702	23,575	3,872	70.9	20.0
Jackson	27,114	11,640	4,582	3,333	6,136	1,423	72.1	16.9
Josephine	15,845	7,198	6,399	1,086	397	765	92.7	40.4
Lane	82,919	58,301	6,754	1,663	12,896	3,305	80.5	8.1
Lincoln	21,013	11,788	692	1,232	6,490	811	65.3	3.3
Linn	34,963	16,978	3,026	1,115	8,663	5,181	60.4	8.6
Marion	7,619	5,400	469	760	80	910	87.0	6.2
Multnomah	3,623	3,500	123	0	35	200	93.9	3.2
Polk	2,544	38	1,105	391	720	290	60.3	43.4
Tillamook	11,151	3,500	1,110	4,190	1,320	1,031	78.9	10.0
Washington	1,971	0	263	0	148	1,560	13.3	13.3
Yamhill	3,745	1,025	943	367	770	640	62.3	15.2
W. Oregon	405,103	200,372	54,954	33,895	82,604	33,278	71.4	13.6
County Aggregations Approximating BLM Districts:								
Salem	135,986	67,754	11,454	12,141	26,572	18,065	67.2	8.4
Eugene	82,919	58,301	6,754	1,663	12,896	3,305	80.5	8.1
Roseburg	94,234	40,191	18,894	7,702	23,575	3,872	70.9	20.0
Medford	42,959	18,838	10,981	4,419	6,533	2,188	79.7	25.6
Coos Bay	49,005	15,288	6,871	7,970	13,028	5,848	61.5	14.0

* Million Board Feet, International $\frac{1}{4}$ Inch Rule.

Appendix C: Table 19 Continued
Forest Statistics

	18	19	20	21	22	23	24
	Net Volume* of Timber Harvested, 1966						BLM
	Total	National Forest	BLM	Other Public	Forest Industry	Other Private	as % of Total
Benton	131,826	18,900	53,113	10,938	30,562	18,313	40.3
Clackamas	420,092	262,100	32,662	1,300	108,060	15,970	7.8
Clatsop	262,113	0	0	23,833	228,927	9,353	0.0
Columbia	99,121	0	843	2,187	74,761	21,330	0.9
Coos	631,705	70,300	131,035	49,744	351,077	29,549	20.7
Curry	357,113	121,500	20,972	2,661	192,305	19,675	5.9
Douglas	1,482,755	394,700	379,903	31,491	629,325	47,336	25.6
Jackson	460,977	116,200	135,615	0	201,782	7,380	29.4
Josephine	148,071	61,000	74,566	4,562	2,545	5,398	50.4
Lane	1,396,492	693,900	156,347	7,150	500,163	38,932	11.2
Lincoln	429,564	121,400	18,038	5,074	251,275	33,777	4.2
Linn	687,698	159,700	77,223	5,060	358,459	87,256	11.2
Marion	87,755	55,700	9,179	9,101	6,195	7,580	10.5
Multnomah	40,321	36,000	23	0	2,649	1,649	0.1
Polk	101,341	500	41,301	4,689	52,442	2,409	40.8
Tillamook	212,402	35,200	28,072	50,203	90,342	8,585	13.2
Washington	28,386	0	4,662	0	10,724	13,000	16.4
Yamhill	57,629	1,600	37,401	0	12,191	6,437	64.9
W. Oregon	7,035,361	2,148,955	1,200,955	207,993	3,103,784	373,929	17.1
County Aggregations Approximating BLM Districts:							
Salem	2,558,248	691,100	302,517	112,385	1,226,587	225,659	11.8
Eugene	1,396,492	693,900	156,347	7,150	500,163	38,932	11.2
Roseburg	1,482,755	394,700	379,903	31,491	629,325	47,336	25.6
Medford	609,048	177,200	210,181	4,562	204,327	12,778	34.5
Coos Bay	988,818	191,800	152,007	52,405	543,382	49,224	15.4

* Thousands of Board Feet, Scribner Log Scale.

Appendix C: Table 19 Continued
Forest Statistics

	25	26	27
	1966 Timber Harvest as a % of 1963 Sawtimber Volume		
	National Forest	BLM	Forest Industry
Benton	2.14	2.56	7.92
Clackamas	1.05	2.17	7.20
Clatsop	---	---	4.40
Columbia	---	6.79	5.75
Coos	2.68	2.40	4.37
Curry	0.96	1.49	3.85
Douglas	0.98	2.01	2.67
Jackson	1.00	2.96	3.29
Josephine	0.85	1.16	6.40
Lane	1.19	2.31	3.88
Lincoln	1.03	2.61	3.87
Linn	0.94	2.55	4.14
Marion	1.05	1.96	7.20
Multnomah	1.05	1.87	7.20
Polk	1.05	3.74	7.20
Tillamook	1.05	2.53	7.20
Washington	---	1.77	7.20
Yamhill	0.16	3.97	1.58
W. Oregon	1.07	2.18	3.76
County Aggregations Approximating BLM Districts:			
Salem	1.02	2.52	4.62
Eugene	1.19	2.31	3.88
Roseburg	0.98	2.01	2.67
Medford	0.94	1.91	3.13
Coos Bay	1.25	2.21	4.17

Sources for Forest Statistical DataColumn
Number

- 1- 2 John M. Radosta, "Contributions of BLM Resource Management to the Economy of Western Oregon" (unpublished Master's thesis, Dept. of Forestry Economics, New York State University, College of Forestry at Syracuse, University, 1966), p.67.
- 3 Robert W. Cowlin and Robert M. Forster, The Timber Situation and Outlook for Northwest Oregon (Resource Bulletin, PNW-12; Portland, Ore.: Pacific Northwest Forest and Range Experiment Station, 1965), p.10.
- This source contained data for Clatsop, Columbia, and Yamhill counties and a data sum for Clackamas, Marion, Multnomah, Polk, Tillamook and Washington counties. The author has estimated county allocations using an ownership map for an undistributed 875,000 acres in these six counties.
- 4 Radosta, op. cit., p.75.
- 5 Calculations by author derived by subtracting BLM land from the "Other Public" commercial forest land given for the counties in the following sources:
- Cowlin and Forster, op. cit.
- John W. Hazard and Melvin E. Metcalf, Forest Statistics for Southwest Oregon (Resource Bulletin PNW-8; Portland, Ore.: Pacific Northwest Forest and Range Experiment Station, 1964), p.9.
- John W. Hazard and Melvin E. Metcalf, Forest Statistics for West Central Oregon (Resource Bulletin PNW-10; Portland, Ore.: Pacific Northwest Forest and Range Experiment Station, 1965), p. 4.
- Inconsistent data between sources is indicated by the negative areas in three counties.
- 6- 7 Cowlin and Forster, op. cit.
- Hazard and Metcalf, Forest Statistics for Southwest Oregon, op. cit.
- Hazard and Metcalf, Forest Statistics for West Central Oregon, op. cit.
- 8 Calculations by author based on columns 1 and 2.
- 9 Calculations by author based on columns 2 and 4.
- 10-11 Cowlin and Forster, op. cit., p.14.
- International $\frac{1}{4}$ inch volume estimated from MBF Scribner rule

Sources for Forest Statistical Data -- ContinuedColumn
Number

volume for Northwestern Oregon counties. Volumes for Clackamas, Marion, Multnomah, Polk, Tillamook and Washington counties were derived from ratios based on the 1966 harvest volume and the 1963 aggregate volume for these counties.

Hazard and Metcalf, Forest Statistics for Southwest Oregon, op. cit., p.9.

Hazard and Metcalf, Forest Statistics for West Central Oregon, op. cit., p.17.

- 12 U.S. Bureau of Land Management, Public Land Statistics, 1963 (Washington, D.C.: Government Printing Office, 1963), p. 127 and 128.

This source indicates 54,953,770 M board feet in W. Oregon and 623,371 M board feet in E. Oregon BLM timber. Caution is necessary, however, because the board foot rule used is not specified. The conservative assumption, that the volume given is in International $\frac{1}{4}$ Inch Rule rather than the Scribner Rule commonly used in the Douglas Fir region, is made in this table.

- 13 Calculations by author derived by subtracting BLM estimates from "Other Public" figures in sources:

Cowlin and Forster, op. cit.

Hazard and Metcalf, Forest Statistics for Southwest Oregon, op. cit.

Hazard and Metcalf, Forest Statistics for West Central Oregon, op. cit.

- 14-15 Cowlin and Forster, op. cit.

Hazard and Metcalf, Forest Statistics for Southwest Oregon, op. cit.

Hazard and Metcalf, Forest Statistics for West Central Oregon, op. cit.

- 16 Calculations by author based on columns 10 and 13.

- 17 Calculations by author based on columns 10 and 12.

- 18-23 Brian R. Wall, 1966 Oregon Timber Harvest (Resource Bulletin PNW-22; Portland, Ore.: Pacific Northwest Forest and Range Experiment Station, 1967), p.2.

- 24 Calculations by author based on columns 18 and 20.

- 25 Calculations by author based on columns 11 and 19.

- 26 Calculations by author based on columns 12 and 20.

- 27 Calculations by author based on columns 14 and 22.

Appendix C: Table 20
Estimated Employment and Establishments by Sector

	A	B	C	Sector No.	1	2	3
	1967 Covered		No. of Reporting Units 3d Qtr. '67	SIC Groups in Sector	01,07, 084,086 09 (ex- cept 0722)	08(ex- cept 084, 086)	10, 11 12, 14
	Avg. Employ.	Payroll					
Benton	10,270	53,446,530	867		1,200		0
Clackamas	22,120	130,991,779	2,169		4,500		94
Clatsop	7,884	46,716,717	765		550		0
Columbia	4,539	29,922,405	457		1,010		47
Coos	13,918	84,866,442	1,198		830		24
Curry	2,857	15,914,369	362		350		7
Douglas	16,412	100,264,451	1,470		1,730		333
Jackson	18,953	112,022,244	1,934		2,920		47
Josephine	6,522	35,674,064	808		1,380	in	15
Lane	46,508	276,095,098	3,926		3,950	sector	466
Lincoln	5,653	29,930,349	778		260	1	69
Linn	15,040	92,194,105	1,317		2,930		106
Marion	35,264	199,037,591	2,734		1,400		53
Multnomah	213,965	1,390,334,669	13,736		1,800		127
Polk	5,053	27,867,581	442		1,400		27
Tillamook	3,439	18,653,880	451		790		28
Washington	24,785	150,772,059	1,962		3,600		76
Yamhill	6,283	32,223,558	746		2,450		57
W. Oregon	450,465	2,826,927,891	36,122		38,650	650	1,576
County Aggregations Approximating BLM Districts:							
Salem	345,295	2,202,091,223	26,424		27,490		684
Eugene	46,508	276,095,098	3,926		3,950	in	466
Roseburg	16,412	100,264,451	1,470		1,730	sector	333
Medford	25,475	147,696,308	2,742		4,300	1	62
Coos Bay	16,775	100,780,811	1,560		1,180		31
Reporting Units by County Aggregations Approximating BLM Districts:							
Salem					292		76
Eugene					45	in	24
Roseburg					16	sector	15
Medford					28	1	14
Coos Bay					10		10
W. Oregon					391		139

Appendix C: Table 20 Continued
Estimated Employment and Establishments by Sector

Sectors	4	5	6	7	8	9	10	11	12
SIC Grps	pt. 15 pt. 17	pt. 16	pt. 15 pt. 16 pt. 17	20	241	242	243	24 NEC	25
Benton	505	34		243	316	638	D	714*	D
Clackamas	1,127	606		436	986	922	328	132	25
Clatsop	589	210		1,234	682	D	D	499*	
Columbia	747	139		55	243	D	D	904*	D
Coos	323	224		645	1,256	1,985	2,780	211	
Curry	103	18		144	378	281	D	1,500	
Douglas	322	292		254	1,674	1,812	3,125	374	D
Jackson	811	308		450	885	1,434	2,270	583	
Josephine	273	48	in	89	367	601	986	70	43
Lane	2,504	1,398	sectors	1,537	2,460	4,123	6,335	1,319	D
Lincoln	176	267	4 & 5	325	346	452	D	402	20
Linn	719	343		772	775	957	2,624	674	
Marion	1,877	566		3,441	363	345	294	164	D
Multnomah	9,991	2,079		7,207	22	917	1,858	2,264	21
Polk	175	76		654	164	621	767	180	1,936
Tillamook	33	57		269	411	481	D	677*	41
Washington	1,423	520		1,299	125	287	D	430*	342
Yamhill	343	85		550	180	315	323	83	
W. Oregon	22,041	7,270		19,604	11,633	16,171 ^D	21,690 ^D	10,687*	2,428 ^D
County Aggregations Approximating BLM Districts:									
Salem	17,705	4,982		16,485	4,613	5,935	6,194 ^D	7,125*	2,365
Eugene	2,504	1,398	in	1,537	2,460	4,123	6,335	1,319	20
Roseburg	322	292	sectors	254	1,674	1,812	3,125	374	D
Medford	1,084	356	4 & 5	539	1,252	2,035	3,256 ^D	653*	43 ^D
Coos Bay	426	242		789	1,634	2,266	2,780 ^D	1,216	
Reporting Units by County Aggregations Approximating BLM Districts:									
Salem	2,480	338		331				799	66
Eugene	446	70	in	39				298	8
Roseburg	92	33	sectors	12				192	
Medford	295	40	4 & 5	27				212	3
Coos Bay	114	31		30				174	
W. Oregon	427	512		439				1,575	77

D indicates employment aggregated to avoid disclosure of data for an individual establishment.

* indicates some employment from other closely related SIC groups which are not shown individually due either to low number or disclosure limitation.

Appendix C: Table 20 Continued
Estimated Employment and Establishments by Sector

Sectors	13	14	15	16	17	18	19	20	21
SIC Grps	26	27	22,23, 28(ex- cept 2819)29 30,31	32	2819, 333,334 335,336 3392	34	35	36	19,37, 331,38 332,39 3391, 3399
Benton	D	89	D	211	D	D	110	D	222*
Clackamas	2,238		892 ^D	269		1,283		406	356*
Clatsop	D	61		10		D	42		589*
Columbia		42	D	D			22		142*
Coos	935	108		19		D	28		84*
Curry	205	16		D					7*
Douglas		103		66			192		707*
Jackson	D	205	10 ^D	161		139	90		257*
Josephine	D	61	D	29	in	D	29	274	106*
Lane	D	548	217 ^D	306	sectors	527	441	57	688*
Lincoln	D	36		46	15 & 21		D	D	574*
Linn	D	131	D	51		D	150	109	1,616*
Marion	752	686	232	106		304	350	D	187
Multnomah	1,705	3,141	6,537	1,237		4,587	5,345	1,494	11,726*
Polk		D	D	59		D	322	D	131*
Tillamook		D	D	D		D	1		34*
Washington	188	268	139 ^D	142			384	6,198	2,314*
Yamhill	D	57	10	82			30	D	720*
W. Oregon	6,023 ^D	5,552	8,037 ^D	2,832 ^D	6,900	6,840 ^D	7,536 ^D	8,538 ^D	20,460*
County Aggregations Approximating BLM Districts:									
Salem	5,818	4,511	7,810 ^D	2,251		6,174	6,756	8,207	18,611*
Eugene	D	548	217 ^D	306	in	527	441	57	688*
Roseburg	D	103	0	66	sectors	0	192	0	707*
Medford	D	266	10 ^D	190	15 & 21	139 ^D	119	274	363* ^D
Coos Bay	205	124	0	19		D	28	0	91*
Reporting Units by County Aggregations Approximating BLM Districts:									
Salem	33	254	219	101		211	239	63	334
Eugene		20	15	15	in	19	29	7	18
Roseburg		11		7	sectors		13		7
Medford		17	4	14	15 & 21	6	13	3	33
Coos Bay	3	12		4			5		14
W. Oregon	36	314	238	141	D	236	299	73	406

D indicates employment aggregated to avoid disclosure of data for an individual establishment.

* indicates some employment from other closely related SIC groups which are not shown individually due either to low number or disclosure limitation.

Appendix C: Table 20 Continued
Estimated Employment and Establishments by Sector

Sectors	22	23	24	25	26	27	28	29	30
SIC Grps	40	41,45, 46,47	42	44	48	49	5098	50 NEC	54
Benton		60	88		190	159		208	290
Clackamas		40	375	20	173	180		2,066	1,126
Clatsop		30	50	219	123	100		131	245
Columbia		77	24	D	30	48		30	181
Coos	not	50	430	388	284	153		374	418
Curry	cov-	D	45	33	17	10	in	50	75
Douglas	ered	53	364	D	187	253	sector	376	506
Jackson		104	474		462	424	29	918	766
Josephine		79	155		96	120		151	347
Lane	1,732	155	912	5	963	288		2,334	1,504
Lincoln		74	183	D	114	51		103	224
Linn		45	376	D	236	220		433	425
Marion		82	437		635	339		1,211	969
Multnomah	4,999	2,637	6,339	3,098	5,251	3,210		25,809	4,430
Polk		D	66		16	27		125	196
Tillamook		5	52	D	81	8 ^D		68	117
Washington	2,001	40	355		D	616 ^D		1,186	867
Yamhill		44	79		87	84		267	232
W. Oregon	8,732	3,575	10,804	3,763 ^D	8,945 ^D	6,290	3,000	35,840	12,918
County Aggregations Approximating BLM Districts:									
Salem	7,000	3,134	8,424	3,337	6,936	5,042		31,637	9,302
Eugene	1,732	155	912	5	963	288	in	2,334	1,504
Roseburg		53	364	D	187	253	sector	376	506
Medford		183	629		558	544	29	1,069	1,113
Coos Bay		50	475	421	301	163		424	493
Reporting Units by County Aggregations Approximating BLM Districts:									
Salem		214	562	17	93	196		2,734	798
Eugene		15	103	4	22	32	in	225	140
Roseburg		7	97		10	8	sector	62	58
Medford		21	102		14	10	29	161	86
Coos Bay		9	78	16	12	13		59	64
W. Oregon		266	942	37	151	253		3,241	1,146

D indicates employment aggregated to avoid disclosure of data for an individual establishment.

Appendix C: Table 20 Continued
Estimated Employment and Establishments by Sector

Sectors	31	32	33	34	35	36	37	38	39
SIC Grps	55	58	52,53, 56,57, 59	60,61, 62,63 64,65, 66,67	70	72,76, 78,79, 84,86	73,81, 89	75	80,82, 0722
Benton	422	409	989	319	113	410	384	67	3,040
Clackamas	1,175	1,216	1,298	715	212	1,078	284	112	3,709
Clatsop	297	731	488	203	408	391 ^D	97	8	575
Columbia	176	229	185	114	77	77 ^D	32	^D	1,030
Coos	520	5,217	939	424	273	449 ^D	237	91	1,540
Curry	110	197	135	82	112	91 ^D	11	18	195
Douglas	679	854	889	431	310	412	311	40	1,131
Jackson	954	1,177	2,039	705	432	859 ^D	400	104	2,422
Josephine	395	381	570	224	291	185 ^D	106	42	889
Lane	1,989	2,325	3,791	1,772	670	1,796	1,108	405	5,555
Lincoln	215	728	299	210	512	397 ^D	67	15	470
Linn	584	733	1,008	465	63	445 ^D	154	62	792
Marion	1,296	1,893	3,441	2,077	268	1,308	882	242	2,543
Multnomah	6,070	10,134	21,221	18,037	3,463	9,464 ^D	8,809	2,350	16,657
Polk	159	278	342	226	10	123 ^D	13	25	362
Tillamook	140	267	174	82	58	100	38	13	462
Washington	1,347	1,010	1,448	810	152	970 ^D	259	155	1,299
Yamhill	354	323	567	365	29	271 ^D	134	19	939
W. Oregon	16,882	23,406	39,823	27,261	7,453	18,724 ^D	13,326	3,768	48,975
County Aggregations Approximating BLM Districts:									
Salem	12,235	17,951	31,460	23,623	5,365	14,932	11,153	3,068	37,243
Eugene	1,989	2,325	3,791	1,772	670	1,796	1,108	405	5,555
Roseburg	679	854	889	431	310	412	311	40	1,131
Medford	1,349	1,558	2,609	929	723	1,044	506	146	3,311
Coos Bay	630	718	1,074	506	385	540	248	109	1,735
Reporting Units by County Aggregations Approximating BLM Districts:									
Salem	1,682	2,048	2,320	2,203	391	2,670	1,672	517	1,209
Eugene	328	273	402	244	63	344	245	95	306
Roseburg	146	120	161	62	40	106	70	22	94
Medford	225	201	493	157	80	217	165	39	219
Coos Bay	119	127	182	85	52	135	70	25	86
W. Oregon	2,500	2,769	3,558	2,751	626	3,472	2,222	698	1,914

D indicates employment aggregated to avoid disclosure of data for an individual establishment.

Appendix C: Table 20 Continued
Estimated Employment and Establishments by Sector

Sectors	40	41	42	43	44	45	46	47	48	49	50
SIC Grps	House- holds, Etc.	92 State Govt#	pt.93 Local Govt#	pt.93 County Govt#	Cap. Con- sump./ Invest.	9108 BLM	9108 FS	91 Other Fed. Govt.	For. Exp.	Dom. Exp.	Non- Resid. Sales, Exp.
Benton		2,480	148	141				699			
Clackamas		847	414	539				716			
Clatsop		463	252	115				130			
Columbia		82	147	98				68			
Coos		840	293	233		92		249			
Curry		33	30	136				134			
Douglas		427	246	564		77		1,370			
Jackson		545	555	482		114		1,015			
Josephine		125		402			in	398			
Lane		3,780	1,200	740		74	sec-	1,330			
Lincoln		253	231	141			tor	202			
Linn		192	165	264			47	510			
Marion		10,450	510	459		103		1,041			
Multnomah		7,800	5,280	2,560		89		10,917			
Polk		244	84	115				76			
Tillamook		114	104	264				225			
Washington		423	405	298				247			
Yamhill		104	286	147				120			
W. Oregon		29,202	10,350	8,697		549		19,447			
County Aggregations Approximating BLM Districts:											
Salem		23,452	8,026	5,189		192		14,951			
Eugene		3,780	1,200	740		74	in	1,370			
Roseburg		427	246	564		77	sec-	1,330			
Medford		670	555	885		114	tor	1,413			
Coos Bay		873	323	369		92	47	383			
Reporting Units by County Aggregations Approximating BLM Districts:											
Salem		206	499	12		3		200			
Eugene		19	51	1		1	in	21			
Roseburg		16	32	1		1	sec-	14			
Medford		29	37	2		1	tor	29			
Coos Bay		17	47	2		1	47	20			

* Except education.

Sources for Estimated Employment and Establishments Data

Column
Number

- A-B Oregon State Dept. of Employment. Research and Statistics Division,
Oregon Covered Employment and Payrolls by Industry, County and
Month (Including Yearly Summary Data) 1967 (Salem, Ore.: 1968), p.21.
- C Oregon State Dept. of Employment. Research and Statistics Division,
Oregon Covered Employment and Payrolls by Industry and County, Third
Quarter, 1967 (Salem, Ore.: 1967), p.20.

Sector
Number

- 1 Agricultural employment data taken from Appendix Table 7, column 4.
- 2 County data unavailable, W. Oregon total estimated by the author
from Appendix Table 19, Sector 2.
- 3-6 Oregon State Dept. of Employment... Oregon Covered Employment... Third
Quarter, 1967, op. cit., p.23-92.
- 7 Oregon State Dept. of Employment... Oregon Covered Employment...1967,
op. cit., p.30.
- 8-21 Oregon State Dept. of Employment... Oregon Covered Employment...Third
Quarter, 1967, op. cit.

Sectors 8-10: All reporting units included in Sector 11.

Sector 11: W. Oregon total exceeds the total for the entire
state (8,508) indicating that at least 2,179 employees have been
added to this sector to avoid disclosure in their proper sectors.

Sector 17: Data not individually available and is included
under Sectors 15 and 21. W. Oregon total estimated from Oregon
total for the included SIC groups.

Sector 21: W. Oregon total exceeds the total for the entire
state (17,999) indicating that at least 2,461 employees have been
added to this sector to avoid disclosure in their proper sectors.

- 22 U.S. Bureau of the Census, 1960 Census of Population (Vol. I: Number
of Inhabitants, Pt. 39: Oregon; Washington, D.C.: Government
Printing Office, 1961), p.293.
- 23-27 Oregon State Dept. of Employment... Oregon Covered Employment...Third
Quarter, 1967, op. cit.

Minor amounts of employment in these five sectors are concealed
in the two sectors, 23 and 27.

Sources for Estimated Employment and Establishments Data (Continued)

Sector
Number

- 28 County data included in Sector 29. W. Oregon total was estimated by the author from data in Appendix Table 19, Sector 28.
- 29-39 Oregon State Dept. of Employment... Oregon Covered Employment...Third Quarter, 1967, op. cit.
- Sector 39: Local and state education data derived by the author based upon ratios (1962/1967) and category totals from data in the following sources:
- U.S. Bureau of the Census, Census of Governments, 1962 (Vol.4: Compendium of Government Finances; pt.34, Government in Oregon; Washington, D.C.: Government Printing Office, 1963), p.35-36.
- U.S. Bureau of the Census, Public Employment, 1967 (Government Employment Series / GE 67, no.1; Washington, D.C., Government Printing Office, 1968), p.17.
- 40 Employment by households not estimated.
- 41-43 Derived by author from:
- U.S. Bureau of the Census, Census of Governments, 1962, op. cit.
- U.S. Bureau of the Census, Public Employment, 1967, op. cit.
- 44 This sector does not involve employment directly.
- 45 U.S. Bureau of Land Management, BLM Facts: Oregon and Washington, 1964-1965 (1966), p.3.
- 46 Included in Sector 47.
- 47 Oregon State Dept. of Employment... Oregon Covered Employment...Third Quarter, 1967, op. cit.
- 48-50 These sectors do not involve employment directly.

Appendix C: Table 21
Number of Firms by Employment Size Class and Industry Groupings
 (March, 1967)

Sector	SIC	No. of Employ- ees	Taxable Payroll (\$1000)	Total Report- ing Units	Size Classes				
					1-7	8-19	20-49	50-99	100+
1	01,07,09,084,086 (ex.0722)	2,156	1,690	386	316	49	16	4	1
2	08 (ex.084,086)	665	573	37	17	10	8	1	1
3	10,11,12,13,14	1,536	2,846	107	66	24	11	3	3
4	pt.15,pt.17	21,030	38,064	2,961	2,191	449	146	34	8
5	pt.16	6,189	12,654	446	283	105	30	16	12
6	pt.15,pt.16,pt.17								
7	20	15,913	23,283	423	146	106	85	49	10
8	241	8,558	12,747	894	628	158	83	16	9
9	242	27,318	44,031	428	129	84	88	59	68
10	2432	22,276	35,744	145	17	14	15	25	74
11	24 NEC*	5,840	8,332	174	72	38	29	20	15
12	25	2,760	4,109	100	57	19	13	4	7
13	26	8,822	14,836	64	8	10	9	4	34
14	27	5,863	8,714	325	192	75	37	14	7
15	22,23,28 (ex.2819) 29,30, 31	4,586	5,076	149	74	37	18	10	14
16	32	2,521	4,249	195	119	49	21	2	5
17	2819,333,334,335,336,3392	D	D	43	6	8	9	3	12
18	34	6,128	10,763	232	102	52	31	21	17
19	35	8,091	14,204	321	173	78	38	21	11
20	36	8,689	12,700	67	24	16	12	8	7
21	19,331,332,3391,3399,37, 38, 39	18,899	33,140	287	12	63	31	24	21
22	40								
23	41,45,46,47	4,210	5,775	289	188	60	30	5	6
24	42	11,392	19,195	1,106	808	192	69	19	18
25	44	3,490	8,213	86	48	18	10	5	5
26	48	10,096	17,041	205	89	62	25	14	15
27	49	5,719	12,279	164	90	26	29	11	8
28	5098	3,394	6,320	286	174	69	32	6	5
29	50 NEC*	38,625	65,695	3,420	2,185	752	339	104	38
30	54	15,116	17,031	1,410	1,055	206	101	27	21
31	55	18,878	22,949	2,864	2,306	366	149	32	11
32	58	23,790	14,561	2,860	1,930	613	276	38	3
33	52,53,56,57,59	41,966	42,026	4,523	3,412	808	202	226	107
34	60,61,62,63,64,65,66,67	29,440	39,944	3,178	2,558	345	177	62	36

* NEC = Not Elsewhere Classified

Appendix C: Table 21 Continued
Number of Firms by Employment Size Class and Industry Groupings
 (March, 1967)

Sector	SIC	No. of Employ- ees	Taxable Payroll (\$1000)	Total Report- ing Units	Size Classes				
					1-7	8-19	20-49	50-99	100+
35	70	8,932	5,762	848	662	104	48	19	15
36	72,76,78,79,84,86	24,464	21,000	4,252	3,504	533	161	41	18
37	73,81,89	14,938	18,345	2,347	1,948	283	78	24	15
38	75	3,782	4,533	725	597	97	27	3	1
39	0722,80,82	79,418	45,897	2,966	2,498	246	119	47	66
40	Households								
41	92: State Govt.(ex.Ed.)	18,051							
42	pt.93: Local Govt.(ex.Ed.)	11,420							
43	pt.93: County Govt.	9,437							
44	Investment								
45	pt.9108: BLM								
46	pt.9108: FS								
47	91 NEC*: Other Fed. Govt.	27,110							
48	Foreign Export								
49	Domestic Export								
50	Nonresident Purchases								

* NEC = Not Elsewhere Classified

Sources for Firm Size and Industry Grouping Data

Sector
Number

- 1-38 U.S. Bureau of the Census, County Business Patterns, 1967
(CBP-67-39: Oregon; Washington, D.C.: Government Printing
Office, 1968), p.4-12.
- 39 Ibid., and
- U.S. Bureau of the Census, Public Employment, 1967 (Government
Employment Series / GE 67, no.1; Washington, D.C.:
Government Printing Office, 1963), p.17.
- 40 Employment by households not estimated.
- 41-43 U.S. Bureau of the Census, Public Employment, 1967, op. cit.

Government employment figures given in terms of full
time equivalent employees for Oct. 1967.
- 44 This sector does not involve employment directly.
- 45-47 U.S. Bureau of the Census, Public Employment, 1967, op. cit.

Data for sectors 45 and 46 included in 47.
- 48-50 These sectors do not involve employment directly.

Appendix C: Table 22
Sector Employment Tabulation Compared to Total Employment

Type of Employment	Sectors	Appendix C Table 20 Employment by Sector	All Employment Appendix C Table 9
Agriculture & Forestry	1- 2	38,650	38,650
Mining (Other Non-Manufacturing)	3	1,576	1,710*
Construction	4- 6	29,311	26,500
Food Processing	7	19,640	19,640
Lumber and Wood Products	8-11	60,181	59,714
Other Manufacturing	12-21	76,145	65,256*
Transportation and Utilities	22-27	42,119	39,640
Wholesale and Retail Trade	28-33	141,769	128,230
Finance and Real Estate	34	27,261	31,260
Service	35-39	92,246	81,490
Government	41-43 45-47	68,245	115,230
Self-Employed			88,170
Total		638,736	695,490

Difference mostly due to self employment.

* Mining has been separated from Other Manufacturing for this Table only.

APPENDIX D
COMPONENT ANALYSIS OF
VARIABLES

Tables 23 through 33

Appendix D: Table 23
Summary Listing of Variables

Variable No.	Table No.	Column No.	Variable	High	Low	W. Ore.	Mean	Standard Deviation
Population								
1	8	11	Urban Population % 1960	96.4	22.4	65.4	44.6	18.4
2	8	23	% of Population in Incorporated Areas 1967	88.4	31.6	58.0	54.6	13.4
3	8	35	% Change in Population, 1960-67	39.0	-11.0	15.2	13.6	15.0
4	8	36	% Change in Population of Cities Over 5000, 1960-67	59.0	65.0	17.6	23.9	19.0
Labor Force, Employment								
5	9	21	Nonagricultural Employment as a % of Total Employment, '67	99.4	79.3	94.4	90.6	5.1
6	9	24	Lumber & Wood Product Employment as a % of Total Employment, 1967	37.1	2.0	8.6	15.3	9.8
7	9	25	Lumber & Wood Product Employment as a % of Manufacturing Employment, 1967	94.3	7.6	40.8	56.1	26.6
8	9	27	Service Employment as a % of Total Employment, 1967	14.5	5.0	11.7	9.6	2.4
9	9	28	Finance Employment as a % of Total Employment, 1967	6.1	1.5	4.5	3.3	1.0
10	9	22	Manufacturing Employment as a % of Total Employment, 1967	39.5	11.6	19.6	25.8	7.9
11	9	34	Covered Manufacturing Employment as a % of Total Covered Employment, 1967	61.0	20.0	32.0	47.1	28.0
12	9	48	% Change in Covered Manufacturing Employment, 1963-66	50.0	-18.0	15.0	11.3	13.0
13	9	64	Reported Covered Employment in SIC 24 & 26 as a % of Covered Manufacturing Employment, July 1967	89.1	8.0	41.2	59.1	25.7
14	9	65	Reported Covered Employment in SIC 24 & 26 as a % of Total Covered Employment, July 1967	52.4	3.1	15.0	25.8	14.6
Manufactures								
15	10	7	Value Added by Manufacture (\$100,000.) 1963	470.0	134.0	775.0	715.7	1031.6
16	10	8	Value Added per Production Worker (\$10.) 1963	1632.0	977.0	1363.0	1293.4	188.5
17	10	11	SIC 24 Value Added as a % of Total Value Added, 1963	99.1	7.7	41.0	51.9	34.7

Appendix D: Table 23 Continued
Summary Listing of Variables

Variable No.	Table No.	Column No.	Variable	High	Low	W. Ore.	Mean	Standard Deviation
Earnings								
18	8	42	Average Annual Payroll per Covered Worker, 1966 (\$)	6245.0	4799.0	5950.0	5654.0	391.2
19	8	45	% Change in Covered Manufacturing Payroll 1963-66	74.4	-8.7	31.1	26.2	15.9
20	8	49	Covered Manufacturing Payroll as a % of Total Covered Payroll, 1966	68.9	18.1	36.8	46.6	14.6
21	11	4	Net Effective Buying Income per Household, 1967 (\$)	9343.0	6864.0	8208.0	7718.0	858.1
22	11	7	Estimated % Households with Income under \$3000, 1967	28.1	15.1	21.6	23.2	3.9
23	11	15	Estimated % Households with Income over \$10000, 1967	27.6	11.8	19.6	16.8	3.8
24	10	6	Wages per Production Worker in Manufacturing (\$1000) 1963	5.71	4.39	5.30	5.2	0.4
25	11	25	% Personal Income from Farms, 1961	6.82	0.18	1.41	3.0	2.3
26	11	26	% Personal Income from Contract Construction, 1961	5.59	1.07	3.80	2.8	1.2
27	11	27	% Personal Income from Manufacturing, 1961	40.0	10.7	18.9	24.6	7.4
28	11	28	% Personal Income from Wholesale and Retail Trade, 1961	17.2	5.3	13.6	9.3	2.7
29	11	29	% Personal Income from Finance and Real Estate, 1961	4.35	0.68	2.86	1.5	1.0
30	11	30	% Personal Income from Transport, 1961	5.78	1.30	4.11	2.5	1.2
31	11	31	% Personal Income from Services, 1961	8.18	1.63	6.44	4.6	1.7
32	11	32	% Personal Income from Federal Government, Civil, 1961	11.9	0.5	3.1	2.7	2.6
33	11	33	% Personal Income from State & Local Government, 1961	22.6	5.6	8.1	9.2	4.0
34	11	34	% Personal Income from Property, 1961	17.6	11.6	13.2	13.9	1.6
35	11	35	% Personal Income from Transfer Payments, 1961	14.1	6.2	8.8	10.3	2.1
36	11	41	Personal Income per Capita, 1964	2405.0	1480.0	2091.0	1882.7	256.8
Allocation of BLM Revenue as Part of County Revenue								
37	12	16	BLM Transfer to County as a % of Total County Revenue, '62	58.6	0.0	20.0	23.4	19.4
38	12	19	BLM Transfer to County Revenue per Capita, 1962 (\$)	59.9	0.5	9.5	15.9	17.4
39	12	20	BLM Transfer to County Revenue per Acre BLM Forest, '62 (\$)	53.3	1.7	6.5	9.7	11.6
40	12	21	Per Capita BLM Transfer as a % of per Capita County Revenue, 1962	59.0	0.0	20.0	26.0	20.1

Appendix D: Table 23 Continued
Summary Listing of Variables

Variable No.	Table No.	Column No.	Variable	High	Low	W. Ore.	Mean	Standard Deviation
Banking								
41	13	7	% Change in Bank Debits, 1963-67	57.7	0.5	36.1	30.7	15.7
42	13	2	Time Deposits and Savings per Capita, 1964 (\$)	1333.0	360.0	1051.0	743.5	359.1
43	13	4	Bank Debits per Capita, 1964 (\$10)	3287.0	272.0	1763.0	1022.0	639.9
Retail Trade								
44	14	5	% Change in Retail Sales, 1954-63	137.0	2.0	43.0	47.1	32.3
45	14	8	Retail Sales in Cities of 5000 or More as a % of County, 1963	90.3	32.1	70.5	55.5	25.6
46	14	15	Total Retail Sales per Capita, 1963 (\$)	1699.0	832.0	1437.0	1276.9	224.0
47	14	19	Eating & Drinking Places Sales per Capita, 1963 (\$)	162.0	58.0	106.0	92.8	30.3
48	14	20	Retail Sales per Establishment, 1963 (\$100)	2031.0	820.0	1617.0	1324.4	338.5
Wholesale Trade								
49	15	6	% Change in Wholesale Sales, 1954-63	542.0	-45.0	84.0	112.4	176.5
50	15	10	Wholesale Sales per Capita, 1963 (\$)	5793.0	232.0	2626.0	1074.7	1205.8
Selected Services								
51	16	8	% Change in Selected Service Receipts, 1958-63	97.1	-1.9	34.2	41.4	21.6
52	16	4	Service Receipts per Capita, 1963 (\$10)	3459.0	876.0	2061.0	1427.5	655.0
Agriculture								
53	17	19	Average Value of Farm Products Sold per Commercial Farm, 1964 (\$10)	2385.0	543.0	1560.0	1426.7	426.9
54	17	7	Number of Commercial Farms (10's), 1964	210.0	18.0	76.0	75.6	51.9
55	17	8	Commercial Farm Land as a % of All Land, 1964	48.9	5.8	16.8	22.3	14.0
56	17	18	% Commercial Farms with Sales over \$10000, 1964	56.0	14.6	33.5	35.5	9.8

Appendix D: Table 23 Continued
Summary Listing of Variables

Variable No.	Table No.	Column No.	Variable	High	Low	W. Ore.	Mean	Standard Deviation
Forest Products Industry								
57	18	6	Pulp and Paper Industry Capacity, Except Hardboard (10 Tons per Day) 1968	1009.0	0.0	77.0	76.8	101.9
58	18	2	Sawmill Capacity, (MBF per Day) 1968	5000.0	237.0	1099.0	1098.7	1078.7
59	18	3	Softwood Plywood Capacity (Mil. Sq. Ft. 3/8" Basis per Day) 1968	1671.0	0.0	458.0	457.9	475.3
60	18	5	Board Production Capacity: Hard, Partical & Insulation (Mil. Sq. Ft. 1/8" Basis) 1968	822.0	0.0	219.0	224.1	311.6
Forest Statistics								
61	19	4	BLM Commercial Forest Area (1000 Acres) 1963	653.0	1.0	129.0	107.9	158.6
62	19	9	BLM as a % of Commercial Forest Land, 1967	34.0	0.2	15.7	12.4	9.8
63	19	8	Commercial Forest Land as a % of All Land, 1963	90.5	47.2	78.6	74.3	14.5
64	19	10	Total Net Sawtimber Volume (100 MMBF) 1963	942.0	20.0	225.0	224.8	255.7
65	19	12	BLM Net Sawtimber Volume (10 MMBF) 1963	1889.0	2.0	305.0	305.2	439.9
66	19	16	Public Net Sawtimber Volume as a % of Total, 1963	93.9	4.9	71.4	63.4	24.8
67	19	17	BLM as a % of Total Net Sawtimber Volume, 1963	43.4	0.2	13.6	14.2	12.0
68	19	18	Total Timber Harvest, (MMBF, Scribner), 1966	1482.0	28.0	390.0	390.8	418.9
69	19	20	BLM Timber Harvest (100 MBF) 1966	3799.0	0.0	67.0	667.2	895.6
70	19	24	BLM Timber Harvest as a % of Total Timber Harvest, 1966	50.4	0.0	17.1	19.6	18.2

Appendix D: Table 24
Summary County Data Used in Component Analysis

County	No.	Variable No.																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Benton	01	52.8	66.9	20.	43.	94.3	7.5	64.5	8.9	2.0	11.6	24.	16.	64.9	16.2	221	1066	75.8	5087
Clackamas	02	56.7	39.6	26.	44.	88.1	6.8	31.3	9.4	3.1	21.9	37.	24.	51.7	19.7	812	1632	17.1	5744
Clatsop	03	55.2	65.8	2.	-5.	95.3	9.8	37.7	11.7	2.3	26.1	38.	8.	38.6	14.5	261	1200	41.9	5913
Columbia	04	22.4	44.8	12.	11.	87.0	14.2	48.0	5.0	1.5	29.5	50.	13.	89.1	43.6	319	1618	0.0	6164
Coos	05	47.3	65.5	-5.	54.	96.0	29.3	86.0	9.9	3.4	34.1	50.	15.	85.4	44.0	692	1235	88.9	5988
Curry	06	18.9	44.0	-11.	0.	92.1	37.1	94.3	5.6	2.7	39.5	61.	-18.	89.1	52.4	223	1240	99.1	5715
Douglas	07	28.5	88.4	10.	31.	93.4	26.2	84.3	8.3	3.0	31.2	50.	5.	83.4	40.6	833	1144	90.7	5967
Jackson	08	46.4	54.8	28.	24.	91.2	14.2	77.3	11.1	4.0	18.4	32.	17.	80.5	26.2	598	1337	84.4	5766
Josephine	09	33.8	36.5	22.	28.	88.2	15.9	74.8	10.1	4.2	21.3	38.	5.	77.4	28.8	256	1151	91.4	5411
Lane	10	61.1	57.6	25.	42.	94.8	18.7	77.4	10.7	3.5	24.1	40.	12.	75.0	29.4	1836	1179	75.9	5776
Lincoln	11	34.1	60.9	-4.	8.	96.7	16.0	61.0	12.6	3.3	26.2	37.	-1.	51.2	18.6	242	1390	47.3	5273
Linn	12	37.6	48.8	14.	25.	87.8	20.5	64.8	8.0	2.5	31.5	51.	15.	62.5	32.2	725	1152	79.1	6087
Marion	13	63.5	55.7	24.	35.	87.8	1.7	14.4	10.3	4.4	12.1	20.	11.	21.4	5.1	685	1331	18.5	5403
Multnomah	14	96.4	70.6	6.	3.	99.4	2.0	11.7	14.5	6.1	17.2	24.	18.	13.4	3.1	4701	1590	7.7	6245
Polk	15	33.8	53.2	27.	11.	82.5	20.0	56.1	7.1	3.5	35.5	56.	1.	53.6	29.8	366	1452	69.5	5256
Tillamook	16	22.4	48.2	-16.	0.	86.3	26.1	83.0	9.0	2.2	31.5	153.	6.	82.5	43.0	135	977	0.0	5310
Washington	17	55.0	31.6	39.	59.	90.6	2.5	7.6	8.0	3.2	33.0	51.	50.	8.0	4.1	867	1454	10.0	5868
Yamhill	18	36.5	50.8	26.	18.	79.3	6.8	36.0	12.8	3.9	19.0	36.	7.	37.0	14.0	191	1134	37.3	4799

Appendix D: Table 24 Continued
Summary County Data Used in Component Analysis

County	No.	Variable No.																	
		19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Benton	01	32.9	33.3	9343	21.2	20.1	5.38	0.64	4.12	15.8	8.4	2.54	1.30	7.22	3.9	15.5	15.5	6.2	1874
Clackamas	02	39.2	44.4	8316	20.0	19.7	5.39	2.78	3.70	19.5	12.3	.95	2.73	5.05	2.0	9.0	17.3	11.3	2256
Clatsop	03	26.7	36.5	7052	7.1	14.5	4.59	.75	2.15	21.4	8.5	1.05	2.66	4.08	3.0	7.2	13.7	11.2	2141
Columbia	04	31.0	63.5	6613	26.5	11.8	5.47	5.92	1.08	32.0	5.3	.93	2.13	1.63	2.9	5.6	14.3	13.8	1683
Coos	05	33.3	53.8	7609	20.7	17.6	5.32	1.74	2.83	29.3	9.7	1.20	4.12	5.11	11.9	6.3	13.4	9.0	1964
Curry	06	-8.7	68.9	7935	18.1	18.2	5.49	5.13	1.91	37.0	6.5	.92	1.28	2.20	.4	8.4	12.9	8.4	1989
Douglas	07	17.6	55.8	7622	19.7	16.0	5.67	.18	2.99	33.7	8.3	1.16	1.37	3.54	4.2	7.5	12.6	10.0	1880
Jackson	08	30.3	40.1	7506	24.3	15.6	5.71	2.57	3.15	18.5	12.6	1.31	2.19	5.52	3.5	7.9	13.7	10.0	1837
Josephine	09	17.4	45.6	6966	28.0	14.0	5.52	1.60	1.46	19.3	9.5	1.54	1.50	5.92	3.0	9.6	15.3	14.1	1578
Lane	10	26.4	47.3	8410	17.7	19.3	5.24	.86	5.59	25.3	11.5	1.14	4.08	5.65	1.8	8.3	12.3	8.2	2099
Lincoln	11	10.0	18.1	6771	28.1	13.5	5.44	.35	1.77	27.1	7.5	.93	1.79	3.75	.6	11.1	14.7	13.2	1864
Linn	12	30.6	53.8	7178	22.6	14.0	5.31	5.47	2.21	32.0	8.9	1.05	2.48	3.39	2.2	7.6	12.0	9.3	1788
Marion	13	25.2	22.1	8090	26.8	16.5	4.58	4.36	4.03	10.7	10.2	3.28	1.46	5.15	1.6	22.9	13.2	9.5	1779
Multnomah	14	33.5	27.4	8508	21.3	22.3	5.46	.19	4.05	14.3	17.2	4.35	5.78	8.18	4.2	5.6	12.5	7.7	2405
Polk	15	16.1	66.8	7053	25.6	14.3	4.82	5.69	2.33	34.2	7.8	.68	1.68	2.63	.9	8.6	11.6	10.7	1439
Tillamook	16	19.7	60.5	7330	24.7	14.4	5.12	5.14	1.07	27.8	6.8	.79	3.09	3.06	.8	9.4	13.3	9.4	1664
Washington	17	74.4	57.8	9758	15.9	27.6	4.82	4.61	4.32	25.6	8.7	1.14	3.18	4.30	.5	7.5	17.6	9.7	2169
Yamhill	18	16.3	43.9	6864	29.2	12.3	4.39	6.82	1.87	18.5	8.4	2.39	1.50	6.31	.7	8.5	14.7	13.4	1480

Appendix D: Table 24 Continued
Summary County Data Used in Component Analysis

County	No.	Variable No.																
		37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
Benton	01	39.1	9.9	7.8	38.0	56.6	712	895	75.	90.3	1118	61	1684	63.	487	64.8	1299	1563
Clackamas	02	19.4	7.2	14.7	19.0	59.4	476	524	90.	55.4	1007	64	1397	542.	1497	58.4	876	1544
Clatsop	03	.0	.0	.0	.0	45.8	1333	990	20.	58.4	1452	147	1049	-8.	385	22.3	2122	1371
Columbia	04	21.9	10.7	21.8	22.0	25.4	503	539	21.	49.9	918	71	987	45.	232	-1.9	488	962
Coos	05	37.4	17.8	5.7	37.0	13.5	607	911	26.	63.6	1383	89	1403	32.	1076	33.4	635	1055
Curry	06	34.6	34.0	6.9	35.0	.5	430	1059	78.	.0	1234	111	1050	457.	718	55.8	1620	1265
Douglas	07	56.0	55.4	6.0	56.0	23.8	570	990	16.	49.5	1171	77	1220	23.	596	51.5	1277	785
Jackson	08	58.6	30.0	5.6	59.0	21.7	788	1125	60.	76.0	1499	97	1583	56.	1573	42.4	1641	1732
Josephine	09	55.4	60.0	6.0	54.0	18.6	958	848	40.	87.9	1572	87	1262	-3.	552	36.2	1662	1076
Lane	10	27.4	13.2	8.2	27.0	38.4	389	1209	63.	77.8	1479	93	1819	49.	1362	64.9	1795	1461
Lincoln	11	3.9	2.2	2.3	4.0	17.8	479	559	25.	41.9	1248	162	820	14.	362	28.9	1778	543
Linn	12	14.3	6.8	4.6	15.0	29.2	769	919	41.	73.6	1297	73	1251	123.	959	17.4	917	1781
Marion	13	5.6	17.4	11.0	56.0	19.7	982	1866	64.	69.9	1463	85	1614	76.	778	43.8	1485	1987
Multnomah	14	1.0	.5	53.3	1.0	39.1	1857	3287	29.	82.4	1699	147	2031	84.	5793	25.2	3459	2385
Polk	15	30.3	12.6	9.2	30.0	34.8	360	272	36.	36.8	832	63	1097	-45.	564	30.4	650	1491
Tillamook	16	4.3	5.0	1.7	4.0	25.1	773	850	2.	.0	1143	107	840	19.	782	30.1	1094	1413
Washington	17	4.2	.9	8.3	4.0	57.7	655	763	137.	32.1	1308	79	1676	492.	1087	97.1	1020	1571
Yamhill	18	8.4	3.2	2.6	8.0	26.1	742	790	25.	53.4	1162	58	1056	5.	542	44.4	877	1695

Appendix D: Table 24 Continued
Summary County Data Used in Component Analysis

County	No.	Variable No.																
		54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70
Benton	01	36	36.0	37.5	5	885	440	90	56	20.0	65.4	77	207	58.3	19.8	132	531	40.3
Clackamas	02	163	13.5	30.9	264	1345	0	0	60	6.3	78.2	296	151	88.6	5.1	420	327	7.8
Clatsop	03	21	48.9	36.1	0	237	80	0	1	.4	88.6	93	2	26.7	0.2	262	0	.0
Columbia	04	40	14.4	26.3	319	860	140	496	11	3.3	81.4	25	12	4.9	4.9	99	8	.9
Coos	05	51	18.6	35.0	34	1775	703	370	167	18.6	87.3	280	546	55.6	19.5	632	1310	20.7
Curry	06	14	8.3	36.8	0	290	270	0	68	8.0	82.4	210	141	69.3	6.7	357	210	5.9
Douglas	07	75	12.0	21.8	108	2320	1294	780	653	22.8	88.4	942	1889	70.9	20.0	1483	3799	25.6
Jackson	08	73	22.9	32.3	0	1235	959	660	43	31.5	75.7	271	458	72.1	16.9	461	1356	29.4
Josephine	09	37	4.4	21.7	0	1015	500	0	310	34.0	88.0	158	640	92.7	40.4	148	746	50.4
Lane	10	105	10.0	35.4	230	5000	1671	730	289	12.3	81.0	829	675	80.5	8.1	1396	1563	11.2
Lincoln	11	18	5.8	14.6	192	677	128	0	24	4.1	92.5	210	69	65.3	3.3	430	180	4.2
Linn	12	121	26.9	44.0	125	990	1085	822	88	8.8	68.5	350	303	60.4	8.6	688	772	11.2
Marion	13	210	38.0	46.7	43	488	112	0	21	5.4	51.1	76	47	87.0	6.2	88	92	10.5
Multnomah	14	48	15.5	46.7	33	525	185	0	5	3.9	47.2	36	12	93.9	3.2	40	0	.1
Polk	15	68	38.6	40.4	0	640	340	0	41	14.8	59.0	25	110	60.3	43.4	101	413	40.8
Tillamook	16	50	7.7	56.0	0	560	220	0	51	7.9	90.5	111	111	78.9	10.0	212	281	13.2
Washington	17	126	35.0	39.4	8	468	0	85	12	4.7	55.7	20	26	13.3	13.3	28	47	16.4
Yamhill	18	105	44.7	37.1	21	466	116	0	43	16.7	56.8	37	94	62.3	25.2	58	374	64.9

Appendix D: Table 25

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70

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Appendix D: Table 26
Component Loadings* (R Mode)
Correlations of Principal Variables with Components

No.	Variable Name	Component Number											
		1	2	3	4	5	6	7	8	9	10	11	12
1	Urban Population % 1960												
2	% of Population in Incorporated Areas 1967								.53				
3	% Change in Population, 1960-67						-.86						
4	% Change in Population of Cities Over 5000, 1960-67									.39			
5	Nonagricultural Employment as a % of Total Employment, 1967												
6	Lumber & Wood Product Employment as a % of Total Employment, 1967	-.52		.55		-.64						-.63	
7	Lumber & Wood Product Employment as a % of Manufacturing Employment, 1967											-.71	
8	Service Employment as a % of Total Employment, 1967								.68				
9	Finance Employment as a % of Total Employment, 1967								.86				
10	Manufacturing Employment as a % of Total Employment, 1967				.91								
11	Covered Manufacturing Employment as a % of Total Covered Employment, 1967				.67					-.57			
12	% Change in Covered Manufacturing Employment, 1963-66					-.68							-.33
13	Reported Covered Employment in SIC 24 & 26 as a % of Covered Mfg. Employ.'67											-.73	
14	Reported Covered Employment in SIC 24 & 26 as a % of Total Covered Employ.'67											-.66	
15	Value Added by Manufacture (\$100,000.) 1963								.61				
16	Value Added per Production Worker (\$10.) 1963									-.31			
17	SIC 24 Value Added as a % of Total Value Added, 1963									.71			
18	Average Annual Payroll per Covered Worker, 1966 (\$)												
19	% Change in Covered Manufacturing Payroll, 1963-66						-.94						
20	Covered Manufacturing Payroll as a % of Total Covered Payroll, 1966				.75								-.30
21	Net Effective Buying Income per Household, 1967	-.92											
22	Estimated % Households with Income under \$3000, 1967	-.91											
23	Estimated % Households with Income over \$10000, 1967	.86											
24	Wages per Production Worker in Manufacturing (\$1000) 1963												
25	% Personal Income from Farms, 1961				.44								
26	% Personal Income from Contract Construction, 1961	-.73			-.68								
27	% Personal Income from Manufacturing, 1961						.47						
28	% Personal Income from Wholesale and Retail Trade, 1961				.82								
29	% Personal Income from Finance and Real Estate, 1961				-.61				.85				
30	% Personal Income from Transport, 1961								.62			.50	
31	% Personal Income from Services, 1961								.57				
32	% Personal Income from Federal Government, Civil, 1961						-.55						
33	% Personal Income from State & Local Government, 1961				-.77				.38				
34	% Personal Income from Property, 1961								.82				
35	% Personal Income from Transfer Payments, 1961								.43				
36	Personal Income per Capita, 1964	-.81											
37	ELM Transfer to County as a % of Total County Revenue, 1962	.92											
38	ELM Transfer to County Revenue per Capita, 1962	.88											
39	ELM Transfer to County Revenue per Acre ELM Forest, 1962							-.58			-.27		
40	Per Capita ELM Transfer as a % of per Capita County Revenue, 1962	.90											
41	% Change in Bank Debts, 1963-67					-.90							
42	Time Deposits and Savings per Capita, 1964										.26		-.53
43	Bank Debts per Capita, 1964												-.62
44	% Change in Retail Sales, 1954-63						.30			.78			
45	Retail Sales in Cities of 5000 or More as a % of County, 1963					-.73				.52			
46	Total Retail Sales per Capita, 1963								.55			-.73	
47	Eating & Drinking Places Sales per Capita, 1963		-.61										
48	Retail Sales per Establishment, 1963	.62											
49	% Change in Wholesale Sales, 1954-63	.75									-.38		
50	Wholesale Sales per Capita, 1963	.50							.81				
51	% Change in Selected Service Receipts, 1958-63							.74					-.38
52	Service Receipts per Capita, 1963								.60				
53	Average Value of Farm Products Sold per Commercial Farm, 1964				-.79								
54	Number of Commercial Farms, 1964				-.46								
55	Commercial Farm Land as a % of All Land, 1964				-.52						-.51		
56	% Commercial Farms with Sales over \$10000, 1964				-.83								
57	Pulp and Paper Industry Capacity, Except Hardboard, 1968										-.78		
58	Sawmill Capacity, 1968	.56											
59	Softwood Plywood Capacity, 1968						-.74						
60	Board Production Capacity: Hard, Partial & Insulation, 1968												
61	ELM Commercial Forest Area (1000 Acres) 1963	.87											
62	ELM as a % of Commercial Forest Land, 1967	.96											
63	Commercial Forest Land as a % of All Land, 1963											-.78	
64	Total Net Sawtimber Volume, 1963											-.81	
65	Public Net Sawtimber Volume, 1963	.87											
66	Public Net Sawtimber Volume as a % of Total, 1963							.39	.61				
67	ELM as a % of Total Net Sawtimber Volume, 1963	.94											
68	Total Timber Harvest, 1966											-.87	
69	Timber Harvest, 1966	.85											
70	ELM Timber Harvest as a % of Total Timber Harvest, 1966	.89											
* Explanation by Component		11.9	16.4	6.1	8.8	9.2	5.7	5.2	11.0	4.3	3.5	10.2	3.4

* Only loadings over $\pm .5$ of the highest 7 or 8 of the 70 variables are shown in the above table.

Source: Component Analysis Program Run & 43921, March 27, 1969

Appendix D: Table 27
Components* and Principal Variables (R Mode)

Var. No.	Load	Variable Name
Component 1: "Urban Growth — High Income" Index (% Explanation: 11.9)		
22	-.91	Estimated % Households with Income Under \$3000, 1967
35	-.81	% Personal Income from Transfer Payments, 1961
21	.92	Net Effective Buying Income per Household, 1967
23	.88	Estimated % Households with Income Over \$10000, 1967
49	.75	% Change in Wholesale Sales, 1954-63
26	.73	% Personal Income from Farms, 1961
36	.73	Personal Income per Capita, 1964
48	.62	Retail Sales per Establishment, 1963
5	.52	Non-Agricultural Employment as % of Total Employment, 1967
50	.50	Wholesale Sales per Capita, 1963
Component 2: "BLM" Index (% Explanation: 16.4)		
47	-.61	Eating & Drinking Places Sales per Capita, 1963
62	.96	BLM as a % of Commercial Forest Land, 1967
67	.94	BLM as a % of Total Net Sawtimber Volume, 1963
37	.92	BLM Transfer to Counties as a % of Total County Revenue, 1962
40	.90	Per Capita BLM Transfer as a % of per Capita County Revenue, '62
70	.89	BLM Timber Harvest as a % of Total Timber Harvest, 1966
38	.88	BLM Transfer to County Revenue per Capita, 1962
61	.87	BLM Commercial Forest Area, 1963
65	.87	BLM Net Sawtimber Volume, 1963
69	.85	BLM Timber Harvest, 1966
58	.56	Sawmill Capacity, 1968
4	.52	% Change in Population of Cities over 5000, 1960-67
Component 3: "Non-Agricultural" Index (% Explanation: 6.1)		
56	-.83	Commercial Farms with Sales over \$10000, 1964
53	-.79	Average Value of Farm Products Sold per Commercial Farm, 1964
25	-.68	% Personal Income from Farms, 1961
55	-.52	Commercial Farm Land as a % of All Land, 1964
54	-.48	Number of Commercial Farms, 1964
5	.55	Non-Agricultural Employment as a % of Total Employment, 1967
24	.44	Wages per Production Worker in Manufacturing, 1963

* Components with variables having a correlation greater than $\pm .5$, or the seven variables having highest correlation.

Appendix D: Table 27 Continued
Components and Principal Variables (R Mode)

Var. No.	Load	Variable Name
Component 4: "Manufacturing" Index (% Explanation: 8.0)		
33	-.77	% Personal Income from State & Local Government, 1961
29	-.61	% Personal Income from Finance & Real Estate, 1961
31	-.54	% Personal Income from Services, 1961
10	.91	Manufacturing Employment as a % of Total Employment, 1967
27	.82	% Personal Income from Manufacturing, 1961
20	.75	Covered Manufacturing Payroll as a % of Total Covered Payroll '66
11	.67	Covered Manufacturing Employment as a % of Total Covered Employment, 1967
Component 5: "Low Manufacturing and Stability" Index (% Explanation: 9.2)		
19	-.94	% Change in Covered Manufacturing Payroll, 1963-66
41	-.90	% Change in Bank Debits, 1963-67
45	-.73	Retail Sales in Cities of 5000 or More as a % of County, 1963
12	-.68	% Change in Covered Manufacturing Employment, 1963-66
4	-.64	% Change in Population of Cities over 5000, 1960-67
32	-.55	% Personal Income from Federal Government, Civil, 1961
54	-.50	Number of Commercial Farms, 1964
Component 6: "Unincorporated & Non-Flywood Area" Index (% Explanation: 5.7)		
2	-.86	% Population in Incorporated Areas, 1967
59	-.74	Softwood Plywood Capacity, 1968
32	-.37	% Personal Income from Federal Government, Civil, 1961
34	.82	% Personal Income from Property, 1961
25	.47	% Personal Income from Farms, 1961
35	.43	% Personal Income from Transfer Payments, 1961
44	.30	% Change in Retail Sales, 1954-63
Component 7: "Service Receipts & Change and Non-BLM" Index (% Explanation: 5.2)		
39	-.58	BLM Transfer to County Revenue per Acre BLM Forest, 1962
24	-.55	Wages per Production Worker in Manufacturing, 1963
16	-.54	Value Added per Production Worker, 1963
18	-.54	Average Annual Payroll per Covered Worker, 1966
51	.74	% Change in Selected Service Receipts, 1958-63
66	.39	Public Net Sawtimber Volume as a % of Total, 1963
33	.38	% Personal Income from State and Local Government, 1961

Appendix D: Table 27 Continued
Components and Principal Variables (R Mode)

Var. No.	Load	Variable Name
Component 8: "Trade and Finance" Index (% Explanation: 11.0)		
9	.86	Finance Employment as a % of Total Employment, 1967
28	.85	% Personal Income from Wholesale and Retail Trade, 1961
50	.81	Wholesale Sales per Capita, 1963
8	.68	Service Employment as a % of Total Employment, 1967
30	.62	% Personal Income from Transport, 1961
15	.61	Value Added by Manufacture, 1963
66	.61	Public Net Sawtimber Volume as a % of Total, 1963
52	.60	Service Receipts per Capita, 1963
31	.57	% Personal Income from Services, 1961
46	.55	Total Retail Sales per Capita, 1963
1	.53	Urban Population %, 1960
Component 9: "Retail Sales Growth and Wood Product Value Added" Index (% Explanation: 4.3)		
11	-.57	Covered Manufacturing Employment as a % of Total Covered Employment, 1967
44	.78	% Change in Retail Sales, 1954-63
17	.71	SIC 24 Value Added as a % of Total Value Added, 1963
45	.52	Retail Sales in Cities of 5000 or More as a % of County, 1963
4	.39	% Change in Population of Cities over 5000, 1960-67
55	.36	Commercial Farm Land as a % of All Land, 1964
16	.31	Value Added per Production Worker, 1963
Component 10: "Low Pulp Industry" Index (% Explanation: 3.5)		
57	-.78	Pulp and Paper Industry Capacity, Except Hardboard, 1968
54	-.51	Number of Commercial Farms, 1964
49	-.38	% Change in Wholesale Sales, 1954-63
15	-.37	Value Added by Manufacture, 1963
16	-.31	Value Added per Production Worker, 1963
39	-.27	BLM Transfer to County Revenue per Acre BLM Forest Land, 1962
42	.26	Time Deposits and Savings per Capita, 1964
Component 11: "Non-Forest Industry" Index (% Explanation: 10.2)		
68	-.87	Total Timber Harvest, 1966
64	-.81	Total Net Sawtimber Volume, 1963
63	-.78	Commercial Forest Land as a % of All Land, 1963
13	-.73	Reported Covered Employment in SIC 24 & 26 as a % of Covered Manufacturing Employment, 1967

Appendix D: Table 27 Continued
Components and Principal Variables (R Mode)

Var. No.	Load	Variable Name
Component 11 (Continued)		
7	-.71	Lumber and Wood Products Employment as a % of Manufacturing Employment, 1967
14	-.66	Reported Covered Employment in SIC 24 & 26 as a % of Total Covered Employment, 1967
6	-.63	Lumber & Wood Products Employment as a % of Total Employment, '67
29	.50	% Personal Income from Finance and Real Estate, 1961
Component 12: "Wealth" Index (% Explanation: 3.4)		
46	-.73	Total Retail Sales per Capita, 1963
43	-.62	Bank Debits per Capita, 1964
42	-.53	Time Deposits and Savings per Capita, 1964
52	-.38	Service Receipts per Capita, 1963
12	-.33	% Change in Covered Manufacturing Employment, 1963-66
18	-.30	Average Annual Payroll per Covered Worker, 1966
16	.37	Value Added per Production Worker, 1963

Source: Component Analysis Program Run A 43921, March 27, 1969

Appendix D: Table 28
Rotated Component Scores (R Mode)
 (70 Variables in 12 Components for 18 Counties)

	Component Number											
	1	2	3	4	5	6	7	8	9	10	11	12
1 Benton	1.53	0.66	0.24	-2.21	-0.76	-0.75	-0.05	-1.60	-0.08	1.92	0.05	0.70
2 Clackamas	0.73	-0.16	-0.44	-0.57	-0.63	2.26	-0.43	0.75	0.08	-0.86	-1.33	2.05
3 Clatsop	-0.61	-3.24	-0.20	0.14	-0.54	-0.42	0.85	-0.51	0.93	1.16	-0.91	-0.54
4 Columbia	-1.01	-0.45	0.15	0.56	-0.50	0.21	-3.10	-1.90	-0.50	-0.71	0.46	0.12
5 Coos	0.38	0.49	0.33	0.93	-0.65	-0.61	-0.24	0.37	0.02	0.56	-0.82	-0.48
6 Curry	0.99	0.10	-0.30	0.55	3.66	0.19	-0.34	-0.55	0.66	0.45	-0.37	-0.19
7 Douglas	0.36	1.12	1.68	0.70	-0.46	-1.66	0.47	-0.55	-0.27	-0.91	-0.25	-0.40
8 Jackson	-0.22	0.72	-0.59	-0.28	-0.28	0.24	-0.74	0.80	0.90	0.88	-0.87	-0.71
9 Josephine	-1.59	1.37	0.95	-0.24	0.04	1.45	-0.23	0.84	0.32	1.40	-0.05	-1.32
10 Lane	1.01	0.46	-0.17	0.37	-0.59	-0.60	0.50	0.78	0.36	-1.10	-1.30	0.04
11 Lincoln	-0.96	-0.78	2.77	-0.67	0.82	0.30	0.78	-0.01	0.01	-1.04	-0.29	0.83
12 Linn	-0.22	0.14	-1.43	0.84	-0.35	-0.52	0.00	-0.25	0.45	-1.09	-0.77	-0.98
13 Marion	-0.14	0.01	-1.16	-2.34	0.52	-0.32	0.33	-0.26	0.39	-1.86	0.95	-0.92
14 Multnomah	0.84	-1.16	0.33	-0.33	0.11	-1.08	-1.40	2.77	-0.72	0.24	1.61	-0.08
15 Polk	-0.98	0.61	-0.84	1.24	0.21	-1.05	0.46	0.08	0.88	0.62	1.16	2.69
16 Tillamook	-0.25	-0.13	-0.86	0.32	0.48	0.23	0.87	0.17	-3.68	0.47	-0.59	-0.03
17 Washington	1.83	-0.27	0.34	1.41	-0.76	1.90	0.97	-0.69	0.30	-0.09	2.14	-0.78
18 Yamhill	-1.67	0.50	-0.79	-0.40	-0.34	0.21	1.27	0.08	-0.04	-0.04	1.18	0.00

Source: Component Scores Program Run A 45009, March 28, 1969

Appendix D: Table 29
Component Analysis (R Mode) on 70 Variables for 18 Counties

No.	12 Components Representing the 70 Variables Name	Eigen- values Latent Roots	Cumula- tive % of Eigen- values	Explanation for % of Variance	
				Each Rotated Component	Cumulative
1	Urban Growth—High Income	18.19	25.99	11.90	11.90
2	BLM	12.05	43.21	16.44	28.34
3	Non-Agricultural	8.84	55.85	6.10	34.44
4	Manufacturing	6.75	65.50	8.89	43.33
5	Low Manufacturing & Stability	5.20	72.93	9.19	52.52
6	Unincorporated & Non-Plywood Area	3.70	78.21	5.69	58.21
7	Service Receipts, Change and Non BLM	3.23	82.83	5.24	63.45
8	Trade & Finance	2.52	86.44	10.98	74.43
9	Retail Sales Growth & Wood Products	2.10	89.44	4.34	78.77
10	Low Pulp Industry	1.83	92.05	3.50	82.27
11	Non Forest Industry	1.60	94.34	10.17	92.44
12	Wealth	1.15	95.98	3.49	95.92

Source: Component Analysis Program Run A 43921, March 27, 1969

Appendix D: Table 30
Grouping Analysis (R Mode)

Combination	Combine With	Distance	Distance Removed	% Left
1	5 with 10	2.2	6.8	99.1
2	5 with 12	2.2	10.2	97.6
3	5 with 8	2.4	13.9	95.7
4	18 with 15	2.6	9.2	94.5
5	5 with 18	2.9	39.0	89.1
6	5 with 7	3.1	28.4	85.2
7	5 with 9	3.5	35.5	80.3
8	2 with 5	3.5	39.2	74.9
9	2 with 13	3.8	45.2	68.7
10	2 with 11	3.8	47.4	62.1
11	1 with 2	4.2	56.2	54.4
12	1 with 3	4.2	58.4	46.4
13	1 with 17	4.2	61.9	37.8
14	1 with 6	4.3	64.7	28.9
15	1 with 4	4.3	67.3	19.6
16	1 with 16	4.3	70.1	10.0
17	1 with 14	4.3	72.6	0.0

Total Distance Before Combinations: 726.18

Source: Grouping Analysis Program Run A 45027, April 2, 1969

Appendix D: Table 31
Matrix of Variable Correlations (Q Mode)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
Benton	1	1.0		-.3							-.3		.4			-.3			
Clackamas	2		1.0													-.3	.5		
Clatsop	3			1.0			-.3		-.3					.4	-.4				
Columbia	4				1.0					-.3		.3	-.4	-.3					
Coos	5					1.0	.6			.4		.3	-.6				-.4	-.4	
Curry	6						1.0						-.4	-.3		.4		-.3	
Douglas	7							1.0		.4		.3		-.4			-.5	-.3	
Jackson	8								1.0	.4							-.3		
Josephine	9									1.0	.3			-.4			-.4	.3	
Lane	10										1.0							-.4	
Lincoln	11											1.0	-.3	-.3			-.4		
Linn	12												1.0	-.3	-.4				
Marion	13													1.0	.4		-.4	.3	
Multnomah	14														1.0	-.5	-.3	.3	
Polk	15															1.0		.4	
Tillamook	16																1.0	-.3	
Washington	17																	1.0	
Yamhill	18																		1.0

Eigen Value = 0.8

Source: Component Analysis Program Run A 44784, April 1, 1969

Appendix D: Table 32
Component Loadings (Q Mode)
 (Correlation of Each Variable (County) with 7 Components)

	Component Number						
	1	2	3	4	5	6	7
1 Benton	-.05	-.12	-.69	-.14	-.07	-.26	.12
2 Clackamas	.04	-.01	.04	-.86	.01	-.13	-.10
3 Clatsop	.21	.57	.21	.43	.16	-.18	-.39
4 Columbia	-.03	-.25	.83	-.15	-.06	-.12	-.05
5 Coos	-.76	.03	.17	.23	-.04	.13	.10
6 Curry	-.15	-.09	.05	.06	.05	.89	.04
7 Douglas	-.81	-.30	.01	.12	.19	.03	.11
8 Jackson	-.15	.09	-.16	.11	-.19	-.10	.87
9 Josephine	.10	-.36	.00	.18	.44	.05	.68
10 Lane	-.75	.16	-.33	-.17	-.16	-.06	-.01
11 Lincoln	-.14	.05	.15	.17	.89	.02	-.08
12 Linn	-.39	-.30	.34	.22	-.62	-.07	-.05
13 Marion	.50	.18	-.53	-.11	-.15	-.39	.06
14 Multnomah	.26	.81	-.19	-.05	-.11	-.17	-.05
15 Polk	.16	-.78	.11	.08	-.17	.06	-.03
16 Tillamook	.07	-.24	.17	.47	-.04	.57	-.25
17 Washington	.33	.20	-.06	-.65	-.31	-.05	-.31
18 Yamhill	.60	-.52	-.22	.22	-.03	-.34	.06

Components and Principal Variables (Counties) Q Mode
 Ranked Component Loadings*

Component Numbers													
1		2		3		4		5		6		7	
Co.	Load	Co.	Load	Co.	Load	Co.	Load	Co.	Load	Co.	Load	Co.	Load
7	-.81	15	-.78	1	-.69	2	-.36	12	-.62	6	.89	8	.87
5	-.76	18	-.52	13	-.53	17	-.65	11	.89	16	.57	9	.68
10	-.75	14	.81	4	.83	3	.43						
18	.60	3	.57										
13	.50												

* County correlations over $\pm .5$ with the component.
 Eigen Value = 0.8

Source: Component Analysis Program Run A 44784, April 1, 1969

Appendix D: Table 33
Component Analysis (Q Mode) on 18 Counties as Variables
for 70 Characteristics

7 Q Components Representing the 18 Counties	Eigen- values Latent Roots	Cumula- tive % of Eigen- Values	Explanation for % of Variance	
			Each Rotated Component	Cumulative
1 Douglas, Coos, Lane, Yamhill, Marion	3.90	21.7	15.99	15.99
2 Polk, Yamhill, Multnomah, Clatsop	2.43	35.2	13.47	29.46
3 Benton, Marion, Columbia	2.32	48.1	10.68	40.14
4 Clackamas, Washington, Clatsop	2.02	59.3	10.48	50.62
5 Linn, Lincoln	1.31	66.6	9.22	59.84
6 Curry, Tillamook	1.12	72.9	8.84	68.68
7 Jackson, Josephine	.86	77.6	8.95	77.63

Eigen Value = 0.8

Source: Component Analysis Program Run A 44784, April 1, 1969

VITA

Name: David H. Nelson

Date and place of birth: October 14, 1934 - Oneida, New York

Education:

	Name and Location	Dates	Degree
High School	Oneida High School Oneida, New York	1948-1952	
College	Rensselaer Polytechnic Institute, Troy, New York	1952-1954	
	State University of New York, College of Forestry at Syracuse University Syracuse, New York	1956-1960	BS
	State University of New York, College of Forestry	1967-1969	MS

Employment Experience:

Employer	Dates	Position
U.S. Army	1954-1956	Construction Surveyor
U.S. Forest Service	Summer 1957	Forestry Aid
Richard F. Howard Consulting Forester	Summer 1958	Timber Cruiser
Henniger and Jones Land Surveyors	Summer 1959	Surveyor
Bureau of Land Management	1960-1961	Forester
Bureau of Land Management	1961-1963	Project Engineer
Bureau of Land Management	1963-1967	Maintenance Engineer
Bureau of Land Management	1967-1969	Graduate Trainee

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